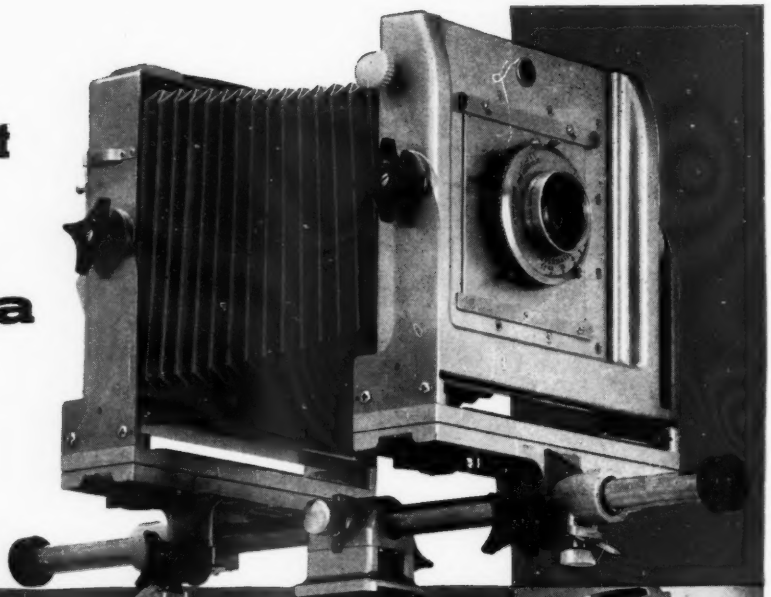
PMI

PHOTO METHODS FOR INDUSTRY

VOL. 2 NO. 9
SEPTEMBER
1 9 5 9
PRICE 50c

beginning this issue: MONTHLY PHOTO INSTRUMENTATION SECTION

only the calumet 4x5 view camera offers the vital

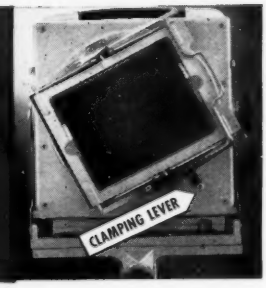


SPRING BACK RELEASE

Fast loading with no jarring, no change of camera position

REVOLVING BACK

Shoot from any angle of a circle without moving tripod!



The Calumet 4 x 5 view camera guarantees you

- both foreground and background detail with no distortion
- crisper, clearer enlargements

The spring back-release, the rotating back are just two of the many features that make the Calumet 4 x 5 view camera your best working partner for all assignments. The swings, the slides, the controls, the rigidity of the all-metal frame . . . these help, too, in getting top photographic quality. Here's a sturdy, versatile camera that's lightweight, easy to carry, easy to handle . . . always competent, always dependable. Try it and see.

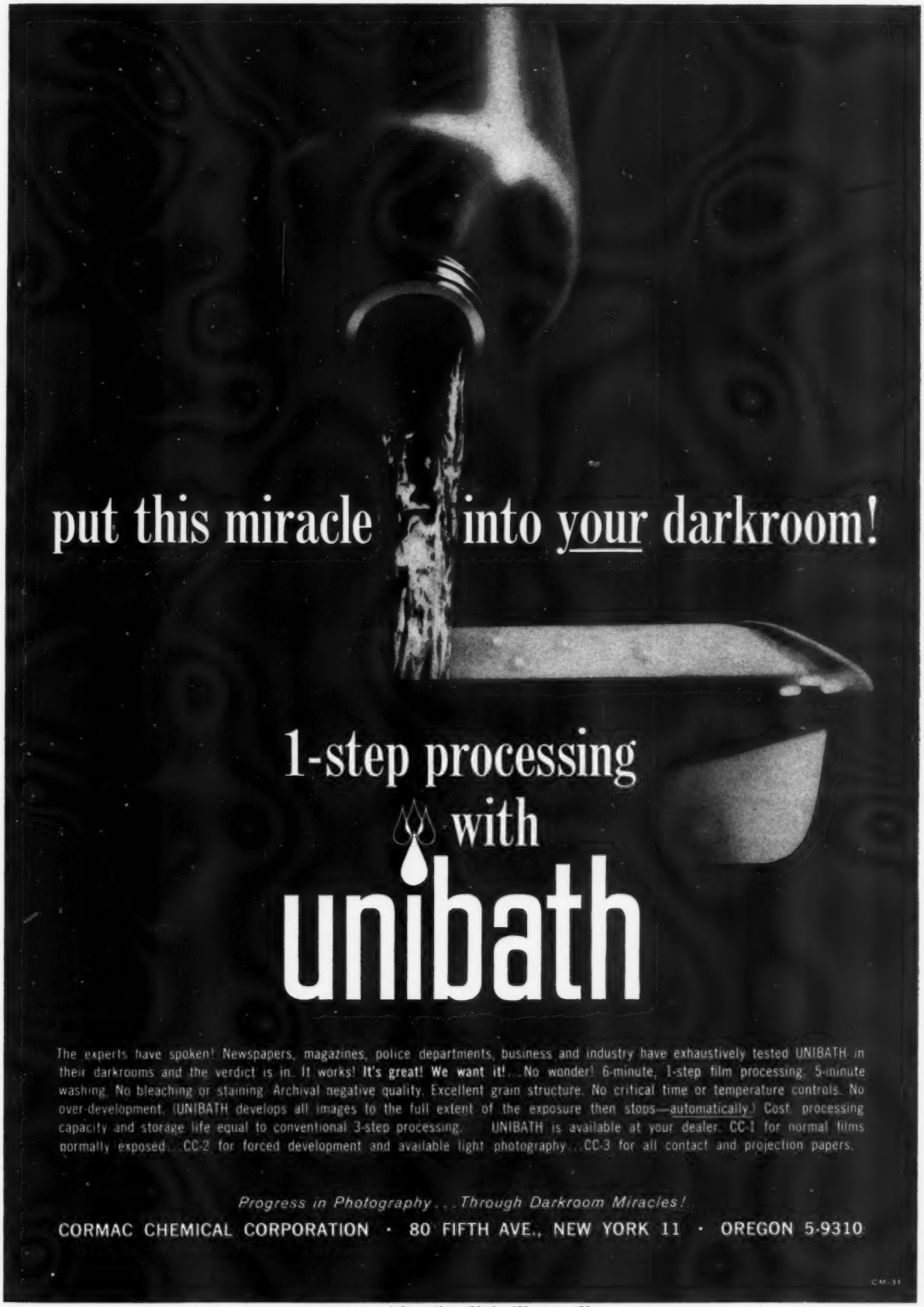
calumet
4x5 view camera
price $175

• *WRITE FOR FREE BOOKLET showing what you can actually do with this view camera*

Calumet MANUFACTURING COMPANY, DEPT. P, 6550 CLARK ST., CHICAGO 26, ILL.

Manufacturers of Cameras, Photographic Processing, Studio and Laboratory Equipment

Get more information. Circle 415, page 81


put this miracle into your darkroom!
1-step processing
with
unibath
The experts have spoken! Newspapers, magazines, police departments, business and industry have exhaustively tested UNIBATH in their darkrooms and the verdict is in. It works! It's great! We want it!. No wonder! 6-minute, 1-step film processing. 5-minute washing. No bleaching or staining. Archival negative quality. Excellent grain structure. No critical time or temperature controls. No over-development. (UNIBATH develops all images to the full extent of the exposure then stops—automatically.) Cost, processing capacity and storage life equal to conventional 3-step processing. UNIBATH is available at your dealer. CC-1 for normal films normally exposed. .CC-2 for forced development and available light photography. . .CC-3 for all contact and projection papers.
Progress in Photography. . . Through Darkroom Miracles!
CORMAC CHEMICAL CORPORATION · 80 FIFTH AVE., NEW YORK 11 · OREGON 5-9310
CM-31

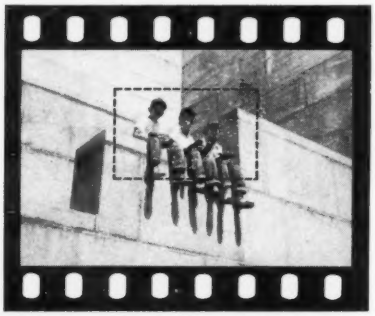
Get more information. Circle 423, page 81

PMI-PHOTO METHODS FOR INDUSTRY IS PUBLISHED MONTHLY BY THE NPD CORP., 33 WEST 60TH ST., NEW YORK 23, N. Y. ACCEPTED AS CONTROLLED CIRCULATION PUBLICATION AT NEW YORK, N. Y. SEPTEMBER 1959 VOL. 2, NO. 9, YEARLY SUBSCRIPTION PRICE IS $4.00 IN THE U.S.A. AND CANADA, ELSEWHERE $10.00

Kodak INDUSTRIAL ROUND-UP

How many clubs

It is perfectly possible to play a round of golf with only a putter. It's been done. The experience could prove somewhat exasperating, however; and it is doubtful that any course records would be set. It is equally true that it is possible to use but one film as a sort of jack-of-all pictures. The trouble is, a single film cannot be perfectly adjusted to every situation because of the multiplicity of variables thrice compounded which faces every professional. In short, Kodak's hard-working scientists and manufacturing specialists could scarcely recommend an all-purpose film as long as photographers must be professionally equipped for the myriad exigencies of their business.



There are, indeed, some films which adapt themselves to many situations. In the field of 35mm for example, consider Kodak Plus-X Pan Film. Here we have a medium-speed, long-scale material having a remarkably fine grain. Take our word for it, there's no grain visible in the blow-up (below) of the small section indicated in the 35mm Plus-X shot. Lots of snap, as you can see. That's because with Plus-X, high acutance and fine grain go hand in hand. Plenty of latitude. No compressed contrast. Broad, broad tone range. (These are things that an all-purpose film would need, whether you're taking newsy story-telling pictures or moody, available-light candids and the like.)

Plus-X Pan is rated at ASA 80 in daylight, but as an exposure meter index setting you may find that 200 is closer to being just right. As usual, this sort of thing depends on your own personal technique. In any case, there is plenty of speed in this film for most uses.

Speed, higher speed, fantastically high speed

Plus-X Pan can be classified as *fast*. It has *speed*. But recently, two additional working plateaus of speed have become practical. Let's call them *higher speed* and *fantastically high speed*.

Higher speed:

The only light for the picture at right (Kodak Tri-X Pan Film, 4 secs, at *f*/5.6—normal development) came from 100-watt lamps in overhead reflectors on the station platform as seen above. In both the full scene and the blow-up, Tri-X Pan has recorded the long scale of tones in this low-light-level situation with top-grade definition. That's high speed with a wanted kind of quality.

You could see these same results with Kodak Royal Pan Film. The major difference being that you'd work with a larger negative, because Royal Pan is a sheet film. Again, not *all-purpose*, but for specific purposes, these films have what you need.

in the golf bag?

Fantastically high speed!

Stopped action at night. Few films are good enough to do a thing like this well, but one that you can depend on always is Kodak Royal-X Pan Film. Meter index used here: 2000; *f*/2.8 at 1/250th; normal development.

Look at the shadow details. Look, also, at those highlights.

Definitely a specific-purpose, fantastically high-speed film. With Royal-X Pan, you can use working indexes as high as 6400 if you have to.

Perhaps it would be a good idea to carry spare rolls (120, 620) or sheets (all sizes) of Royal-X in your bag. You never know when you'll run into a situation where it will be the only film fast enough to work.

Other specific-purpose films you should know about:

Suppose someone wants a big, big picture. For a mural, a display, or the like.

Or, suppose you run into a short-scale subject—white on white, for example.

Such pictures are setups for Kodak Panatomic-X Film. Its fine, fine grain allows huge blow-ups. It also has high acutance, (sharpness, if you will), and the wonderful ability to distinguish delicate shades of tonal difference in low-contrast scenes.

With this kind of definition in Panatomic-X, many photographers use this sheet film as a multi-purpose material. But since it's ASA rated at 32 daylight, 25 tungsten, and since it will hold its quality through indexes up in the neighborhood of 100 daylight, we must say Panatomic-X is excellent for a set of purposes, but it's not all-fired fast enough for *all purposes*.

For copy negatives that look like originals, Kodak Gravure Copy Film

A one-purpose film that does its job superbly. This film captures nearly all of the vitality and highlight detail, making copies hard to tell apart from originals. With this film, you can control contrast in the copy by your exposure—with no development worries. Try a few sheets for the best copies you've ever made!

There are other films for other purposes, some you may have missed. Check a *Kodak Films* data book to see which may fit your purposes.

All-purpose paper? Almost!

We can call Kodak Polycontrast Paper an *almost* all-purpose paper. It does everything you want a paper to do most of the time. With one sheet you can obtain any of these contrast grades: 1, 1½, 2, 2½, 3, 3½, and 4 simply by using Polycontrast filters numbered 1, 1½, 2, 2½, 3, 3½, 4 in your enlarger.

Polycontrast reproduces negative tones beautifully. Image color and speed are comparable to that of Kodak Medalist Paper. You have a choice of F, N, and G surfaces. So with only one box you can turn out quality prints with any negative worth using. What's more, you can do the same thing with Kodak Polycontrast Rapid Paper. The only difference is that Rapid has image color and speed comparable to Kodabromide Paper, and it's available in F, N, G, and Y surfaces.

And now there is a third multi-contrast material with the intriguing name of Kodak PolyLure Paper. Here we have a printing material with all the one-box convenience the other two have, plus a special emulsion producing the warm-toned glow so desirable for portraiture. PolyLure uses the same filters as the other Polycontrast papers.

Considering aesthetics alone, many people make for many shades of taste and opinion, and many such opinions make for many needs. Kodak Medalist and Kodabromide Papers are at your dealer's, should one of these make you happiest. Perhaps you simply like the "feel" of working with these or other specific Kodak papers. This is a good enough reason. And it's the reason there are "many clubs in the golf bag." If you would like to know more about all of these materials—any of which will produce a fine photographic image—be sure you have the Kodak data book *Professional Printing with Kodak Photographic Papers*.

L'envoi

When you get right down to it, there really isn't any such thing in this complicated world as an all-purpose anything. Latitude, yes.

Kodak has a material to match every need—made to the requirements of the perfectionist. Films, papers, and chemicals—made together to work together, without compromise. This phenomenon, we like to think, has helped nurture a happy breed, freed from concern about anything but making the best photographs in the world.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Kodak
TRADE MARK

SEPTEMBER, 1959

VOL. 2 NO. 9

FEATURES

35 EDITORIAL
The Future Starts Tomorrow

36 SLIDE FILM PRODUCTION
Gordon R. Ray's quality control for color filmstrips

42 PORTFOLIO NO. 17
General Dynamic's annual report soars with in-plant photos

48 CIBA TRAINING CENTER
Pharmaceutical firm speeds sales training with A-V

52 READERS' SHOWCASE
Two pages of choice industrial pictures from PMI readers

54 LILLY NEWSREEL ***J. R. Root and William C. Herman***
Writer-photographer capsule employee news on 3G budget

58 SUGGESTIONS MAKE MOVIES
Remington Rand executive spreads word with film

PHOTO INSTRUMENTATION SECTION

63 MOTION MEASUREMENT ***William G. Hyzer***
The quantitative approach to high-speed cine analysis

70 SPIE REPORT ***E. E. Reshovsky***
Annual meeting summarizes progress in instrumentation

DEPARTMENTS

8 FYI A column of personalities and news for your information

10 COMING UP Calendar of exhibits, conferences and organizational meetings

12 METHODS FOR TOMORROW Videograph uses cathode-ray tube to print image at lightning speed. *Lloyd E. Varden*

17 MICROREPRODUCTION There is a time for thought and a time for action, in that order. *Vernon Tate*

20 REPRODUCTION & GRAPHIC ARTS Direct printing plates with gelatin relief; other research news. *Herbert P. Paschel*

24 INDUSTRIAL COLOR More remedies to help correct improper processing procedures. *Samuel Lang & Leonard Zoref*

28 ELECTRONIC FLASH PPofA sees new equipment, Ansco color film for electronic flash. *Edward R. Farber*

30 WORKING PHOTOGRAPHER Some comments on how to remember when to push, pull and click . . . *David B. Eisendrath, Jr.*

32 INDUSTRIAL MOTION PICTURES Projectionist, spare that film, or, a scream for scenes on screen. *Arnold Eagle*

77 FREE LITERATURE Booklets, folders and data—yours merely for the asking.

83 NEW PRODUCTS What's new on the market for the photographer in American industry

EVERETT GELLERT, *Publisher*
AUGUSTUS WOLFMAN, *Ed.-in-Chief*
MARTIN E. SIEGEL, *Business Mgr.*

Editorial Board:
JACQUELYN BALISH
ARNOLD EAGLE
HERBERT KEPPLER
ERNEST G. SCARFONE
ROY STRYKER

STAFF:
WALLACE HANSON, *Editor*
HAROLD MARTIN, *Exec. Editor*
RAMON RUSTIA, *Manag. Editor*
ANTHONY PALAGONIA, *Art Dir.*
LLOYD E. VARDEN, *Tech. Editor*
DAVID B. EISENDRATH, Jr., *Tech. Editor*
HERBERT P. PASCHEL, *Graph. Arts Ed.*
ERNEST RESHOVSKY, *Western Ed. Cor*
JUDITH SEGAL, *Edtl. Asst.*
MILTON GORBULEW, *Circ. Mgr.*
MILTON ASTROF, *Adv. Mgr.*
JULES WARTELL, *Eastern Adv. Mgr.*
S. WILLIAM PATTIS, *Midwest Sales*
BERT DELLINS, *Western Adv. Mgr.*
FAY TRAVERS, *Prod. Mgr.*
FRIEDA HOFFENBERG, *Adv. Prod.*

PMI—Photo Methods for Industry is published monthly by the NPD Corp., 33 West 60th St., New York 23, N. Y. Plaza 7-3700. Mid-west: 6316 N. Lincoln Ave., Chicago, Ill. Irvington 8-4242. Coast: 13758 Victory Blvd., Van Nuys, Calif., Triangle 3-4153. Copyright 1959 NPD Corp. Single copies 50 cents. Yearly subscription price is $4.00 in U.S.A. and Canada. Elsewhere $10.00. Editorial contributions must be accompanied by return postage and will be handled with reasonable care; however, the publisher assumes no responsibility for return of unsolicited photographs or manuscripts.

Send today for your FREE catalog, listing detailed specifications of each... emulsion types, printing speeds, contrasts, surface weights, etc.

"POW"

From the 1954 Graflex Photo Contest—Palmer Pederson, Billings, Montana

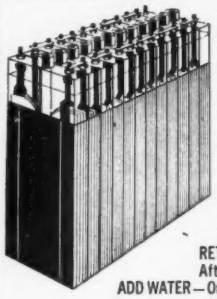
Industrial Photographs Come to Life on Haloid® Photographic Papers

Industrial photography has emerged in the last several years as one of the most important functions of any industrial organization. Similarly, the need for detailed, long-lasting prints has grown. Try some of the best photographic papers in the business . . . including: *Varaloid®*, an excellent variable contrast paper most often used for commercial enlarging; *Halobrome®*, a high grade projection paper; *Halex®*, a contact paper especially suited for industrial photography and photo finishing; *Industro®*, a contact paper much in demand for commercial and portrait work. *Write:* HALOID XEROX INC., 59-384 Haloid St., Rochester 3, N. Y. Branch offices in principal cities.

HALOID XEROX®

Get more information. Circle 440, page 81

NEW F & B POWER-MITE NICKEL CADMIUM BATTERIES



LARGEST CAPACITY—6-10 amp. hours
SMALL-LIGHT—6 oz. per 1.25 v.cell
INDESTRUCTIBLE—Can be stored indefinitely in any condition
SAFE—No Acid Spray or corrosion
CHARGES EASILY—To 90% in 20 minutes, and 100% in 30 minutes
RETAINS 70% CHARGE—After 1 year's storage
ADD WATER—Only a few drops ONCE A YEAR
PERMANENT ELECTROLYTE—30% solution of Potassium Hydroxide
Batteries are supplied in a metal case with a leather carrying strap and plug.

7½ Volt—Power-Mite battery (6 cells) ..... $ 85.00
15 Volt—Power-Mite battery (12 cells) $135.00
Attached voltmeter—optional ..... $ 20.00

F & B's Power-Mite batteries can be supplied in any combination to power practically all cameras, recorders, etc. All the features listed are absolutely guaranteed by F & B. The Power-Mite nickel cadmium battery is unconditionally guaranteed for one full year.
SPECIAL BATTERIES CUSTOM-BUILT TO YOUR ORDER

NEW IMPROVED F & B CAMERA SLATE

Here at last is the new F & B Camera Slate designed to professional specifications. Look at some of the exclusive features: Permanently attached ring-mounted numbers • Spring-loaded hardwood clapstick • Sturdy masonite construction • Erasible hard slate finish • Large 12" x 16" size

Reg. $29.50 NOW...$14.95

MILLER FLUID DRIVE HEAD

F & B proudly announces the exclusive distribution of the Miller Fluid Heads in the Eastern United States. The Miller Head is the world's finest precision built hydraulic drive pan head, and is designed for super-smooth panning and tilting. Can be used with any movie camera.

Fits all Tripods.
Write for complete information and literature NOW.

Model D (medium duty) $150.00
Swivel leveling joint 59.50
Pro Head (heavy duty) 299.50

FLORMAN & BABB, INC.
68 West 45th Street, New York 36,
New York • MUrray Hill 2-2928

Get more information. Circle 433, page 81

F.Y.I.

Everyone knows how we simply hate and loathe gossip so don't tell anyone where you heard these items. They are personal, but we feel that someone should report what goes on in this industry of ours.

What three well-known movie producers received awards from what well-known film laboratory? Well, the Producer Services Department of the George W. Colburn Laboratory in Chicago, presented Awards of Merit to Mervin LaRue (Mervin W. LaRue, Inc.), Bob Richardson (Barber-Greene Co.) and Larry Warnock (Link-Belt Co.), at a luncheon July 15, at Chicago's Merchants and Manufacturers Club. LaRue's awards was for 40 years of film making, especially in research and medical films. Richardson got his for "Dragmat", an animated color film for sales training, with Warnock, A-V Coordinator for Link-Belt named "Outstanding Film Producer of the Year".

Margaret Bourke-White, a veteran industrial photographer (she took a Graflex where angels feared to tread) was named No. 1 in the top ten women photographers according to a poll by the Professional Photographers of America. Runners-up included Lisa Larsen, Ruth Orkin, Berenice Abbott, Suzanne Szasz, Tana Hoban, Esther Bubley, Dorothea Lange, Constance Bannister and Bunny Yeager.

"Woody" Woodson, Du Pont's envoy to the photo industry, known as Jennings B. Woodson, Jr. to his intimates at Du Pont's Photo Products Division, is leaving the hustle and bustle of business to teach photojournalism at San Jose State College. Associate Professor Woodson taught at the University of Illinois before joining Du Pont, and is the founder of the Illinois' Press Photographers Short Course.

The world of a-v

Robert Abrams of Williams, Brown and Earle, Philadelphia, has been elected treasurer of the National Audio-Visual Association during its recent convention in Chicago. He also accepted a plaque citing his firm's record of 35 years as a Bell & Howell A-V dealer.

Speaking of things audio-visual, the Society of Motion Picture and Television Engineers reports that the dollar volume in the non-theatrical film field hit $255,000,000, quite a chunk of change. The report, in the June, 1959 issue of the SMPTE Journal, lists the six major users of non-theatrical films and their expenditures last year as: **1.** business and industry, $150 million; **2.** governments (federal, state, local), $48 million; **3.** educational groups, $27 million; **4.** religious groups, $15 million; **5.** civic and social groups, $8 million; and **6.** medical and health groups, $7 million. The largest single expenditure in the field is movies and filmstrips, accounting for 37 per cent of the total spent. The 47,950 people produced 7,300 films.

Some more gossip

Authenticolor has established an industrial division, headed by Richard Luria, to serve photographers, artists and art directors in industry, unquote.

We did not want to brag about the award to David B. Eisendrath, Jr. so we made only a slight mention of it in the last issue. But as a magazine of record (we like to think of ourselves as "The New York Times" of the industrial photographic field) some details seem to be in order. The award went to him from the Professional Photographers of America and is its Director's Award for "his energetic devotion to the cause of applied photography, for the inspiration his enthusiasm for the profession has been to others, for his continuing efforts for the recognition of photography as a tool of benefit to business, industry, government and education . . ." This is only a partial quotation for the citation but it should give you some idea of why we are inclined to be a little proud.

For what reason we don't know, but wives of our acquaintance always seem to be unduly suspicious about business trips, especially to such centers of commerce and industry as Paris, Atlantic City, Miami Beach or Gary, Indiana. Our expla-

(*continued on page* 90)

check and see how the automatic features of the new

NIKON F AUTOMATIC REFLEX

make it the finest 35 mm reflex you can use...

1. The automatic features of the Nikon F—Instant-Return Mirror, Instant-Reopen Diaphragm, Instant-Action Preview Control—*are internally coupled.*

2. The Instant-Return Mirror automatically returns to precise focus position regardless of the angle of the camera—*even if held upside down.*

3. The Instant-Reopen Diaphragm automatically stops down and instantly reopens without disturbing or moving the diaphragm setting—*even if that setting is between aperture markings.*

4. The Auto-Nikkor lenses for the Nikon F Automatic Reflex may be interchanged at any time. And the automatic diaphragms remain fully operative *whether they are interchanged before or after the shutter is wound.*

5. The Instant-Reopen Preview Control for observing depth-of-field *does not have to be re-set manually.* Press the button, and the diaphragm automatically closes down to 'taking' aperture. Release the button, and *the diaphragm reopens instantly—automatically.*

6. The Instant-Action Preview Control is entirely independent of the shutter release mechanism. When using the Preview Control it is *impossible to cause an accidental exposure.*

7. The automatic action of the mirror and diaphragm is so incredibly fast, it is virtually imperceptible in the finder. Even with the camera and accessory Electric Motor Drive—shooting *at the rate of 3 exposures per second, there is still a continuous, bright image constantly visible in the finder.* The image never blacks out; never dims.

The qualities we have enumerated are especially revealing of the maker's intense devotion to perfection. You will discover many more qualities in the New Nikon F Automatic Reflex, each equally deserving of your admiration, and each further demonstrating that the Nikon F is the finest automatic reflex you can own. See for yourself.

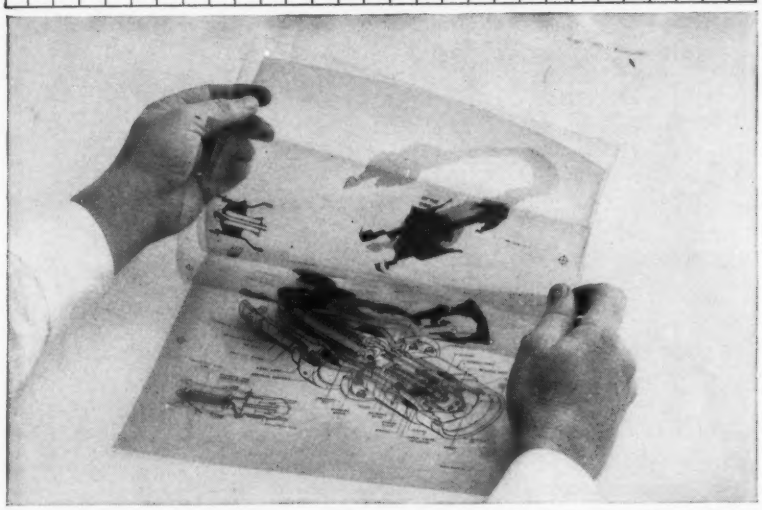
Nikon F Automatic Reflex with 50mm Auto-Nikkor f2 lens, $329.50 at your Franchised Nikon Dealer. For fully descriptive literature write to Dept. PM-9

Nikon Inc., 111 Fifth Avenue, N. Y. 3.

In Canada: Anglophoto Ltd., 880 Champagneur, Montreal, P.Q.

Get more information. Circle 478, page 81

DRAFTING TRENDS



Color overlays using POST's new Vapo Chromtex color foils give this intricate drawing maximum readability with consistent color fidelity.

Color overlays tell faster visual story

Broader use of color overlays is more and more in evidence every day. Many engineers and designers have discovered that color provides a faster visual communication of highly complex subjects in technical manuals, intricate drawings, flip charts, "exploded" views and schematics.

Of course, color overlays are not new. But, until recently multiple sets had not reached their maximum performance potential. The POST laboratory has devoted more than two years in perfecting a series of ten color foils that meet the most rigid standards. Multicolor sets of films are now produced easily and quickly on any standard white print machine (dry diazo process). These new POST products are called Vapo Chromtex.

POST's technicians successfully eliminated difficulties previously encountered in some of the diazo films on the market, developing consistent color fidelity and the proper brilliance for most effective readability. POST's Vapo Chromtex films come in ten vivid colors: black, red, green, blue, orange, brown, magenta, cyan, yellow, and violet. These clean, bright colors offer a range that is broad enough to cover even the requirements of the most intricate graphic communication.

Unusually sharp image detail

POST Vapo Chromtex has a special acetate base which gives the necessary strength to resist buckling, and has desirable extra stability to insure accurate registration. Use of this base also provides a flat, uncurled print. Equally important, POST's Controlled Coating formulations assure unusually sharp image detail with clear, unclouded backgrounds.

Chromtex also offers good resistance to normal light, hence less image fade. This color foil series falls naturally into your normal reproduction routine. Each of the ten colors fully develop in one pass, and can be conveniently handled by any operator of ammonia process reproduction equipment.

Sample prints, processing data sheet available

If you want to know more about color overlays or if they have been a problem in the past, we will be glad to send you POST Vapo Chromtex sample prints and processing data sheet. *Write to Frederick Post Company, 3666 N. Avondale Avenue, Chicago 18, Illinois.*

POST

SENSITIZED PAPERS & CLOTHS • TRACING & DRAWING MEDIUMS • DRAWING INSTRUMENTS & SLIDE RULES
ENGINEERING EQUIPMENT & DRAFTING SUPPLIES • FIELD EQUIPMENT & DRAFTING FURNITURE
Get more information. Circle 484, page 81

COMING UP

SEPTEMBER 20-25 Instrument Society of America Conference and Exhibit, The Amphitheater, Chicago, Ill.

SEPTEMBER 27-29 6th Annual Convention of New Jersey PPA, Berkeley Carteret Hotel, Asbury Park, N. J.

SEPTEMBER 28-OCTOBER 1 3rd Annual Industrial Film & Audio-Visual Exhibition, Trade Show Bldg., New York, N. Y

OCTOBER 5-9 86th Semi-Annual Convention of the Society of Motion Picture and Television Engineers, Statler-Hilton Hotel, New York, N. Y.

OCTOBER 26-30 National Convention of the Society of Photographic Scientists & Engineers, Edgewater Beach Hotel, Chicago, Ill.

MONTHLY MEETINGS

FOURTH MONDAY • Rocky Mountain Industrial Photographers. Contact P. H. Broadie, 2170 S. Lincoln, Denver 10, Colo. Telephone PEarl 3-2200.

LAST MONDAY • Southern California SPSE. Contact Ben Augustine, 235 Annandale Rd., Pasadena 2, Calif. Telephone MU 1-0076.

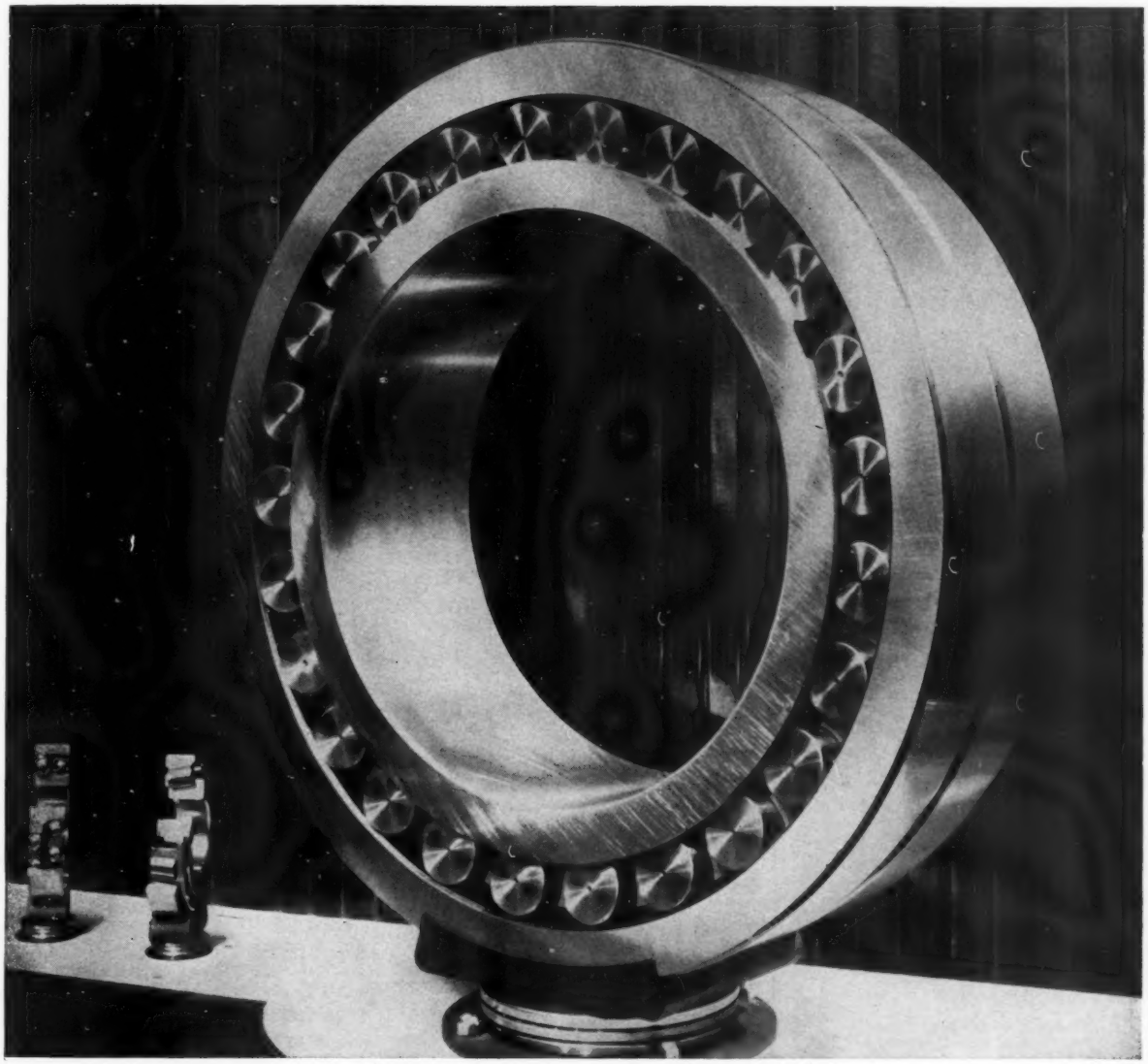
SECOND TUESDAY • New England Police Photographers. Contact Sergt. William R. Murphy, Brookline Police Dept., Brookline, Mass. RE 4-1212.

THIRD TUESDAY • Binghamton Chapter of SPSE. Contact H. G. Morse, Ansco, Binghamton, N. Y. RA 2-4221, Ext. 573.

SECOND & FOURTH THURSDAY • Industrial Photographers Association. Contact Tom Holbarton, 181 Lake Drive West, Packanack Lake, Wayne, N. J. OX 4-2058. Or R. Handley, The Port of New York Authority, 111 8th Ave., New York 11, N. Y. AL 5-1000, Ext. 605.

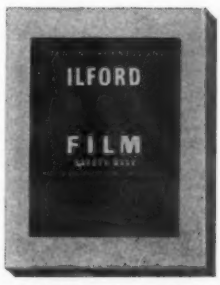
PMI inaugurates this section as a service to its readers. If you wish to have your organization's meetings listed in future issues send the necessary information addressed to **COMING UP, PMI,** *33 West 60th St., N. Y. 23, N. Y.*

for high fidelity . . . ILFORD HP3 film



Photograph by Pilkington for Skefko Ball Bearing Co., England. Ilford HP3 negative, developed in Ilford Phenidone Developer; original print on Ilford Bromide Paper.

FAST . . . FAITHFUL. Whatever the industrial assignment, there is no more dependable all-purpose film available than Ilford HP3. It is fully panchromatic and it is fast—ASA 200. In either natural or artificial light, HP3 produces the kind of grain-free negative with tone detail that leaves nothing unsaid . . . as this photograph demonstrates. If your regular supplier does not have Ilford HP3, write us.



Made in all standard sheet and roll sizes.

ILFORD INC. 37 West 65th Street, New York 23, N.Y.

IN CANADA: Canadian distributors for Ilford Limited, London: W. E. Booth Co., Ltd., 12 Mercer St., Toronto 2B

Get more information. Circle 449, page 81

ēthol/UFG
THE ONE
ULTRA FINE GRAIN
DEVELOPER
THAT DOES THE WORK
OF TWELVE
...and much better!
High contrast • high speed
• low contrast • fine grain •
proportionate • soft working
Frustrating isn't it? The biggest problem after taking a picture is what developer to use.
Now — with ēthol's UFG — you can solve any processing problem and get ultra fine results with any kind of film in an average developing time of 3 to 6 minutes.
Use it and you'll agree, for your finest shots, no other developer will do.
ASK YOUR DEALER ABOUT ēthol's COMPLETE LINE OF PAPER AND FILM DEVELOPERS.
ēthol
UFG
PLYMOUTH PRODUCTS CO., INC.
1770 W. Berteau Ave. • Chicago 13, Ill.
Get more information. Circle 483, page 81

by Lloyd E. Varden

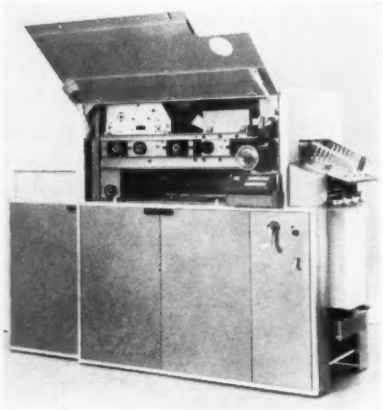
PHOTO METHODS FOR TOMORROW

Videograph uses cathode-ray tube to print image at lightning speed

More and more we are seeing electronic procedures introduced for image reproduction. In July, the A. B. Dick Co., Chicago, announced a new electronic system, which they call the Videograph Process, capable of almost instantaneous image recording. The speed of the process is truly fantastic, although in quality of reproduction it is a long way from that obtainable by the photographic process.

The Videograph Process can be adapted for various applications. Its first application is actually for printing address labels, but it can be used as a facsimile device, or even for producing pictures almost instantaneously of moving objects. The speed of the process is indicated by the fact that 20,000 letters, numbers or similar symbols can be printed per second. In the above mentioned address label application, 36 complete labels are printed per second, making it possible for the New York publisher who has installed the equipment to turn out 10,000,000 labels a week on a one-shift basis with only two units. Prior to this, using older type equipment, 18 machines were necessary, working on a two-shift basis.

Picture of railroad train moving approximately 15 mph *(above)* is printed from Videograph tape. A. B. Dick's Videograph is pictured below.



How it works

For the process an especially designed cathode-ray tube is utilized. The tube does not have the usual phosphor coating and so it does not produce a visible image. Rather, the face of the tube has a matrix of numerous fine wires fused into a plate. Thus, the vacuum of the tube can be maintained but the electron beam scanning the ends of the wires on the inside of the tube cause an electrostatic "image" to be transferred through the wires to the *outside* of the tube. As the electrostatic charges are formed, they are immediately transferred to a rapidly moving web of paper which has a di-electric coating, e.g., polystyrene. The negative charges on the paper surface then attract oppositely charged particles of a pigmented resin powder which, when heated, form a permanent image on the paper surface. Actually, the powder consists of two parts, namely, a carrier and a toner. The carrier is negatively charged and the toner is positively charged. In the "development" step the toner is thus attracted to the paper, whereas the carrier is repelled.

For use as an address label printer or in any other printing application, the data fed into the Videograph to control the electron beam scanning pattern can be taken from punched cards, punched paper tape, magnetic tape or directly from a computer. For facsimile applications, special scanning devices are necessary and, also, the cathode-ray tube in this case has only a single line of fine wires fused horizontally across the

(*continued on page* 14)

PRECISION-MADE FOR THE PROFESSIONAL!

STROBOFLASH* By GRAFLEX

Stroboflash electronic flash units are precision-made by Graflex to meet the most stringent photographic requirements of the professional. They have won unqualified endorsement by professionals the world over. Choose from three models, each designed to meet specific requirements, each finest in its field:

STROBOFLASH I is made for use where light weight is desired and fast lenses or film are used. Short duration flash (1/1400 second) makes it perfect for action. 50 watt sec. Less batteries, only $89.00. Photo Tube accessory kit provides "slave" operation, only $9.90.

STROBOFLASH II is a rugged, all-purpose portable which withstands rough handling and hard use. Designed for and used by professionals and advanced photographers. 100 watt sec. Less batteries, only $99.50. Photo Tube accessory kit provides "slave" operation, only $9.90.

STROBOFLASH IV, by means of its 4-way power selector, permits variance of exposure without changing f number. The ultimate in electronic flash. 200 watt sec. Less batteries, only $165.95. Photo Tube accessory kit provides "slave" operation, only $9.90.

For complete information on Stroboflash units see your Graflex dealer or write Dept. PMI-99, Graflex, Inc., Rochester 3, N. Y. A Subsidiary of General Precision Equipment Corporation.

GRAFLEX | A GENERAL PRECISION COMPANY

*Trade Mark. *Prices include federal tax where applicable and are subject to change without notice.*

Get more information. Circle 438, page 81

the VOIGTLANDER-ZOOMAR — World's FIRST and ONLY ZOOM Lens for Still Cameras

from ASSOCIATED PRESS
by Irving Desfor

"Undoubtedly the outstanding innovation of the M.P.F.D.A. show is the introduction of the world's first zoom lens for still cameras."

Now, in studio or on location, one lens serves better, does more, than a complete set. With Voigtlander-Zoomar, any popular single lens reflex camera with focal plane shutter ZOOMS from 36 to 82mm lens range, from ONE shooting position.

Super-flexible! Here are the most useful focal lengths for the 24 x 36 mm format—36 for wide angle, 50 for all-'round work, 82 for telefoto, and EVERY FOCAL LENGTH BETWEEN, all without lens change or calculation. Just move the ring while viewing and shoot! At all focal lengths, choose any aperture from f/2.8 to f/22.

Voigtlander-Zoomar, fully automatic on Voigtlander Bessamatic cameras, $298. Semi-automatic on most single lens reflex cameras with focal plane shutters, $318. Does not interfere with interchange of conventional lenses on any camera. It's Voigtlander-Zoomar for new profit, new kick in professional photography!

EXCLUSIVELY FROM

VOIGTLANDER

SINCE 1756 SAY FŌTLANDER

H. A. BOHM & CO. SOLE AMERICAN IMPORTERS • 4761 W. TOUHY, CHICAGO 46, ILLINOIS

Get more information. Circle 500, page 81

METHODS FOR TOMORROW

(*continued from page* 12)

long dimension of the tube face.

Facsimile information can be reproduced on sheets up to legal size. A prototype machine has performed web printing at rates as high as 180 ft. per minute, which is equivalent to printing three 8½ x 11-in. sheets per second. The printing operation can take place miles away from the pick-up point if the scanning and reproducing units are connected by a coaxial cable or a microwave link. As a matter of fact, The Rio Grande Railroad has already contracted for the installation of Videograph scanner and printer units along 800 miles of their system at seven freight terminals. When completed they will be able to transmit the copies of waybills, train lists, wheel report forms and written messages practically instantaneously.

A. B. Dick anticipates numerous further applications in business and industry, a complete list of which they will send upon application.

The end results

To demonstrate the almost instantaneous picture recording capabilities of the process, Dick's technicians took a picture of a railroad train moving at approximately 15 miles per hour. The halftone reproduction of this picture which they sent to me shows no discernible blur in the railroad company's name and engine number painted on the side of the train. For making the picture, a television type pickup tube was employed as the scanning unit.

Soundtrack or sound track?

Maybe you have never considered it before—I never had—that the term "soundtrack" refers to either the sound of a motion picture in general, or to the mixed track physically reproduced on the print, whereas the term "sound track" refers to the individual track (voice, music or effects track) as described in editing and re-recording procedures. This distinction is made by Frank Lewin in Part IV of a series of papers under the general heading "The Soundtrack in Non-Theatrical Motion Pictures." These papers are being published in the *Journal of the Society of Motion Picture and Television Engineers.* Parts III and IV appeared in the July, 1959 issue. They are so complete in every detail that an abstract of them would be next to impossible. But industrial photographers engaged in motion picture work should make it a point to have these papers before them.—THE END

Don't ask us to help you with the love interest.

If your script needs tinkering, go to a script doctor! Feel free, however, to come to CECO* with any technical problem. Chances are we have in stock the equipment to do what you want done. If not, we'll alter or combine—even custom-build it for you. Don't bet there's any mechanical problem CECO can't solve. In addition, we sell, rent and service the finest professional photographic equipment. Your patronage is always appreciated—whether you make a major purchase or buy a bottle of film cement.

*CECO—Trademark of Camera Equipment CO

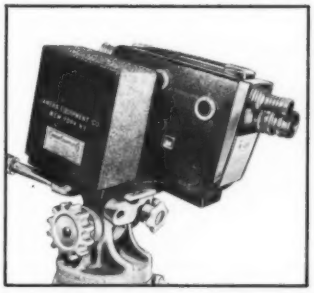
FRANK C. ZUCKER

CAMERA EQUIPMENT CO., INC.

Dept. 3 315 West 43rd St., New York 36, N. Y. JUdson 6-1420

GAUMONT-KALEE Transistorized Magnetic Sound Attachment for ARRIFLEX 16

Converts ARRIFLEX 16 into a single system magnetic sound camera unit that's compact, lightweight, well-balanced. Unit is mounted between camera and tripod head. Transistorized amplifier. ARRI can still be used as silent camera by simply removing sound attachment.

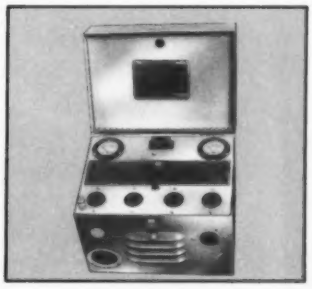


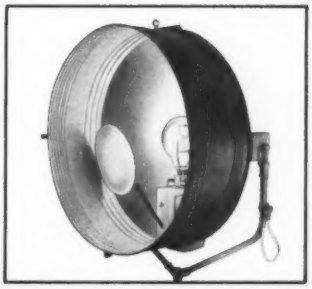
110 Volt AC Synchronous Motor for Kodak Model K-100 Camera

A fine, precision motor that drives camera at exact sound speed of 24 fps. Easy to attach, no special tools required. Synch motors for other cameras available.

Colortran Master "Chief" Converter

Has every improvement and convenience feature for motion picture work. Portable, yet large in capacity. Can be used as master control panel to set up individual line intensity variations. 30 amps from 220 volts; 45 amps from 115 volts.





CECO Cone Lights 5000 Watt —2000 Watt—750-1000 Watt

Floods large area with shadowless, soft light. Can be placed close to actors. Complete with switch, 25 ft. cable and yoke. (5000 Watt illustrated).

Additional Products

CECO offers the world's largest and most comprehensive line of professional cameras, accessories, lighting, editing, processing and animation equipment including: MAURER Products (Exclusive Distributor); Oxberry Animation Equipment; Cooke Speed Panchro Series II, Kinetal, Kinoptic, and Bausch & Lomb Baltar Lenses. Other products we carry are: Color Charts - Computers - Splicers - Exposure meters - Projectors - Screens - Marking pencils and pens - editors gloves - stop watches.

Rentals

Cameras - 16mm and 35mm

Editing Equipment

Lighting Equipment

Generators - Truck mounted or Portable

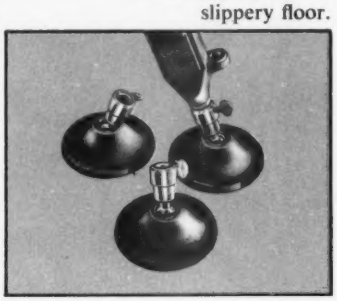
Sound Equipment

Projection Equipment

Grip Equipment

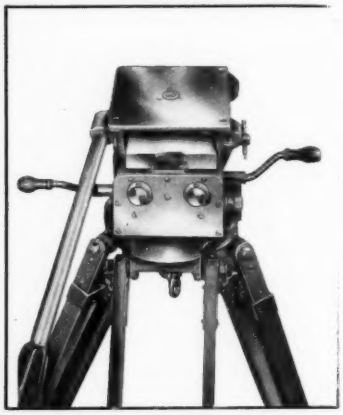
Sta-Sets

Made of the finest rubber in the shape of a suction cup, these Sta-Sets keep tripods from slipping on any slippery floor.



CECO Professional Junior Gyro Tripod

Features "controlled action" with slow and fast speeds for both panning and tilting. Only 19 lbs. Can be used as geared head. Ideal for 16mm Maurer, Mitchell, B&H Eyemo and similar cameras

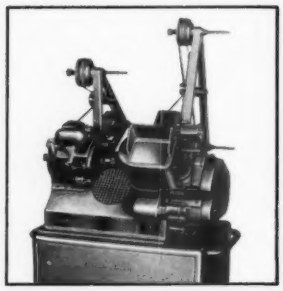


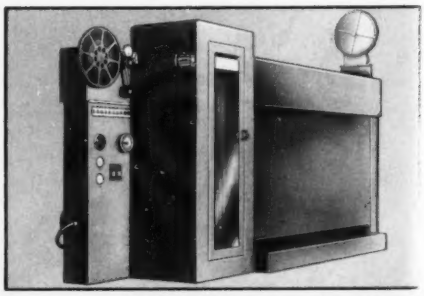
MOVIOLA Crab Dolly

The ultimate in camera mobility. Features crab, conventional and locked steering. Boom raised to 60" or lowered to 22" by hydraulic cylinder. 2 seats can be shifted to 6 different positions. All aluminum carriage. Length 64"; Width 34".

MOVIOLA Film Editing Machine "Series 20"

Available in several models to meet various requirements. Streamline-styled. Clear sound quality. Convenient to use. Large screen size. Short pieces can be used without putting film on reels.





FILMLINE Processor Model R60

Heavy duty Reversal and Negative-Positive processor with completely controlled processing. Has exclusive "Temp-Guard" system. Feed-in and take-up elevators for continuous operation. Output speeds to 3600′ per hour. Other models available.

Ask about our Precision Repair and Design Engineering Service!

SALES
SERVICE
RENTALS

FRANK C. ZUCKER

CAMERA EQUIPMENT CO., INC.

Dept. 3 315 West 43rd St., New York 36, N. Y. JUdson 6-1420

by Vernon D. Tate

MICROREPRODUCTION

There is a time for thought and a time for action, in that order

The time to prepare to use microfilm is before it is made. This obvious fact is too often overlooked or passed over in eagerness to get on with the job. Later, neglect can make a great deal of difference in cost and in the ultimate usefulness of the job or the technique. Bear in mind that microfilm perpetuates not only the document but also the arrangement of the documents. A microcopy of a printed book whose pages are numbered and enclosed as a unit in a binding offers few problems. A file of miscellaneous correspondence, of plans and blueprints, land titles, medical or personnel records will require quite different handling.

Form and function

The nature and frequency of reference to a file on microfilm will determine the best of many alternative methods of preparation. Probably the least complicated problems exist in making insurance or security copies of valuable records. Stored in a vault apart from the originals, the copies are intended for use only in event of disaster or unforseen need. Even here the file should be adequately targeted and supplied with a full description photographed on each roll of film stating what the records are, when they were photographed and why. The other extreme would be a case where the microfilms are made as an integrated part of a complete operating routine, to be read, tabulated and processed by machine.

In 1960 the decennial census of the United States will be taken. For several years preparations have been under way for this gigantic undertaking. Microfilm is the heart of the operation. A bank of about 40 microfilm cameras will film all of the original data sheets. A reduction ratio of 28:1 on 16mm film will be used. Each roll will be 100 ft. in length. The completed microfilms are to be fed into a bank of FOSDIC III machines which read the film and record the data on magnetic tapes. Finally the tapes are fed into two large electronic computers for final processing. In all operations time is at a premium and the scheduling is very tight. (Note: Details of the manufacture and use of the FOSDIC III machines are contained in an article by M. L. Greenough of the National Bureau of Standards in *Proceedings* of the 8th Annual Meeting of the National Microfilm Association, 1959, pp. 279-286.)

Between the above extremes is a vast area of microfilm application. The standard roll length for 16, 35 or 70mm microfilm is 100 ft. To this must be added short lengths of leader and trailer for threading and protection. From 800 to 3,200 documents or pages, or even more in some cases, can be placed on 35mm film for example. The ratio of reduction or the placement, that is, the location of the image on the film so that the reading line is parallel to the film width or length will govern the number of originals.

For some applications the standard 100-ft. roll is perfectly satisfactory. Insurance or security microfilms are maintained in this form. Newspapers on microfilm are conveniently used in full rolls. Books however often require smaller reels. An ordinary book of 600 pages as usually filmed at low reduction on 35mm film will require some 35 ft. For these 50-ft. reels are used. It is customary for books and similar self-contained entities to maintain volume integrity. One book to one roll of microfilm is the rule. This works very well for books and similar originals of appreciable length. Scientific articles, monographs, research reports, preprints, patents and other documentation may only contain a few pages and require only a few frames of microfilm. It is difficult to use a miscellaneous assortment of copies of this type on full 100-ft. rolls. Records that require additions or corrections at irregular intervals are difficult or

(*continued on page* 18)

UNUSUAL OPTICAL BUYS

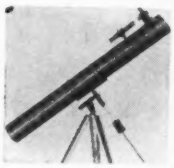
Terrific Buy! American Made!
OPAQUE PROJECTOR

Projects illustrations up to 3" x 3½" and enlarges them to 4 ft. ide. No film or negatives needed. Projects charts, diagrams, pictures, photos, lettering in full color or black-and-white. Operates on 115 volt, A.C. current. 6-ft. extension cord and plug included. Operates on 60 watt bulb, not included. Size 12" x 8" x 4½" wide. Weight 1 lb., 2 oz. plastic case with built-in handle.
Stock No. 70,199-EL ..... $7.95 postpaid

SALE! TERRIFIC WAR SURPLUS BARGAINS!
AERIAL CAMERA LENSES

Big variety . . . at a fraction of Government cost! f 6. 24" f.1. with diaphragm and lens cone-used. Weight 25 lbs.
Stock No. 85,059-EL
$39.50 F.O.B. Utah
Same as above, but new. Weight 25 lbs.
Stock No. 85,060-EL ..... $59.50 F.O.B. Utah
f 8. 40" f.1., no mount or shutter. Weight 6¼ lbs.
Stock No. 70,186-EL ..... $49.50 Postpaid
f 5.6, 20" f.1. telephoto with shutter and diaphragm. Weight 6¼ lbs.
Stock No. 70,187-EL ..... $65.00 Postpaid
f 4.5, 6¾" f.1. with shutter and diaphragm. Weight 1 lb., 6 ozs.
Stock No. 70,189-EL ..... $24.50 Postpaid

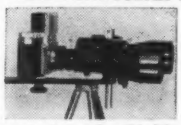
See the Stars, Moon, Planets Closeup!
4¼" ASTRONOMICAL TELESCOPE!
MT. PALOMAR TYPE!
Up to 270 Power!



With this scope you can see the craters on the Moon, the rings of Saturn, double stars. Mirror guaranteed to give theoretical limit of resolution. Rack and pinion focusing, removable mirror mount, counterweight. Real equatorial mounting—only one adjustment follows stars! Aluminum tube. 6 Power Finder Telescope. 2 standard size Eyepieces and Mounted Barlow Lens give you powers of 40X, 90X, 120X, 270X. Mirror f/11. Mirror corrected to better than ¼ wavelength. FREE with Scope:—Valuable **STAR CHART** plus 272 page **"HANDBOOK OF HEAVENS"** plus **"HOW TO USE YOUR TELESCOPE"** BOOK.
Stock No. 85,006-EL..... $74.50 f.o.b. Barrington, N. J.

Same Telescope as above but equipped with Electric Clock Drive—
Stock No. 85,004-EL..... $111.50 f.o.b. Barrington, N. J.

NEW BINOCULAR-TO-CAMERA HOLDER



For Exciting Telephoto Pictures

Bring distant objects 7 times nearer with a 35 mm. camera, 7x50 binocular and our NEW BINOCULAR - TO - CAMERA HOLDER. Ideal for long-range shots of wild life, ships, planes, people, etc. Camera and binoculars attach easily. Use any binocular or monocular—any camera, still or movie. Take color or black and white. Full directions for taking telephotos.
Stock No. 70,223-EL ..... $11.50 postpaid

WAR SURPLUS!—INFRARED SNOOPERSCOPE
Govt. Cost $900—Bargain at $39.50

Watch your film develop in darkroom. Converts infrared to visible light. See in total darkness without being seen. Use in lab, factory, classroom, etc. Completely portable. Operates on two flashlight batteries (not included). Image is quite good, may be made even better by careful focusing. Size 11½" x 8". Weight with carrying case 12 lbs. No infrared light source is furnished. (See below).
Stock No. 85,098-EL..... $39.50 f.o.b. Barrington, N. J.

INFRARED LIGHT SOURCE AVAILABILITY!
You will need a 6-volt transformer or 6 V auto battery to operate.
Stock No. 80,035-EL ..... $10.00 Postpaid

Order by Stock No.
(Send Check or M.O.—Money-Back Guarantee)

WRITE FOR
FREE CATALOG-EL

100 pages! Over 1,000 items
Optics for the Space Era! Huge selection of lenses, prisms, war surplus optical instruments, parts and accessories. Telescopes, microscopes, satellite scopes, binoculars, infrared sniperscopes, science experiment items, math learning and teaching aids. Request Catalog EL.

EDMUND SCIENTIFIC CO.
BARRINGTON, NEW JERSEY

Get more information. Circle 429, page 81

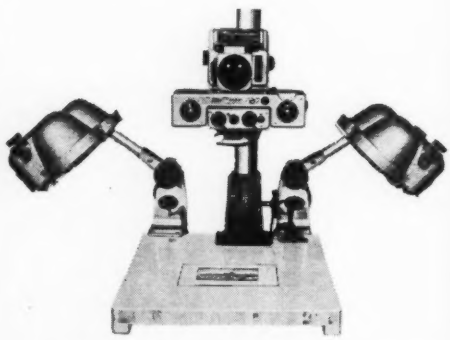
FASTEST
FINEST
EASIEST
WORKING
ENLARGER
EVER DESIGNED
FOR 35mm

DURST M-35 MICROMAT

Fully Autofocus Enlarger and Copy Camera!

Combine highest accuracy and finest possible optical quality when using the DURST M-35 (Micromat) for your black and white enlarging . . . color enlarging and "duping". . . copying — opaque or transparent . . . microfilming — camera, reader and enlarger — all in one!

Comes fully equipped with custom-fitted Schneider lens, factory installed. Instantly converts to precision copy camera.



TECHNICAL DATA:

- WITH SCHNEIDER COMPONAR OR COMPONON LENSES.
- RAPID TRANSPORT GLASSLESS NEGATIVE CARRIER.
- AUTOFOCUS TO 17X ON BASEBOARD; TO 35X BY ROTATING COLUMN.
- ADJUSTABLE VARIATOR SCALE FOR DIFFERENT EASEL HEIGHTS.
- BUILT-IN MAGNIFICATION SCALE.
- BUILT-IN VIEWFINDER FOR COPY WORK.
- BUILT-IN FILTER RECEPTACLE FOR COLOR BLACK AND WHITE.
- DISTORTION CONTROL.
- RAPID COUNTER-BALANCED HEIGHT ADJUSTMENT.

FULL RANGE OF ACCESSORIES AVAILABLE TO FULFILL ALL YOUR DARKROOM REQUIREMENTS.

See the DURST M-35 (Micromat) at your franchised DURST dealer.
Write for DURST Booklet 584-P.

DURST (USA) INC. Dept. PMI-1
1140 Broadway, New York 1, N.Y.

Durst

Get more information. Circle 428, page 81

MICROREPRODUCTION

(*continued from page* 17)

impossible to use satisfactorily.

The classic advice of "divide and conquer" applies quite as well to roll microfilm as to military or political operations. By dividing a long roll into segments or even single documents many otherwise difficult problems can be resolved. At the same time a large number of valuable advantages in filing, storing, sorting, arranging and otherwise manipulating data on microfilm become apparent.

Well developed and instrumented means exist for converting roll microfilm into segments or units for convenient handling. The processes, termed unitization, are among the areas of opportunity in microrecording.

Unitization

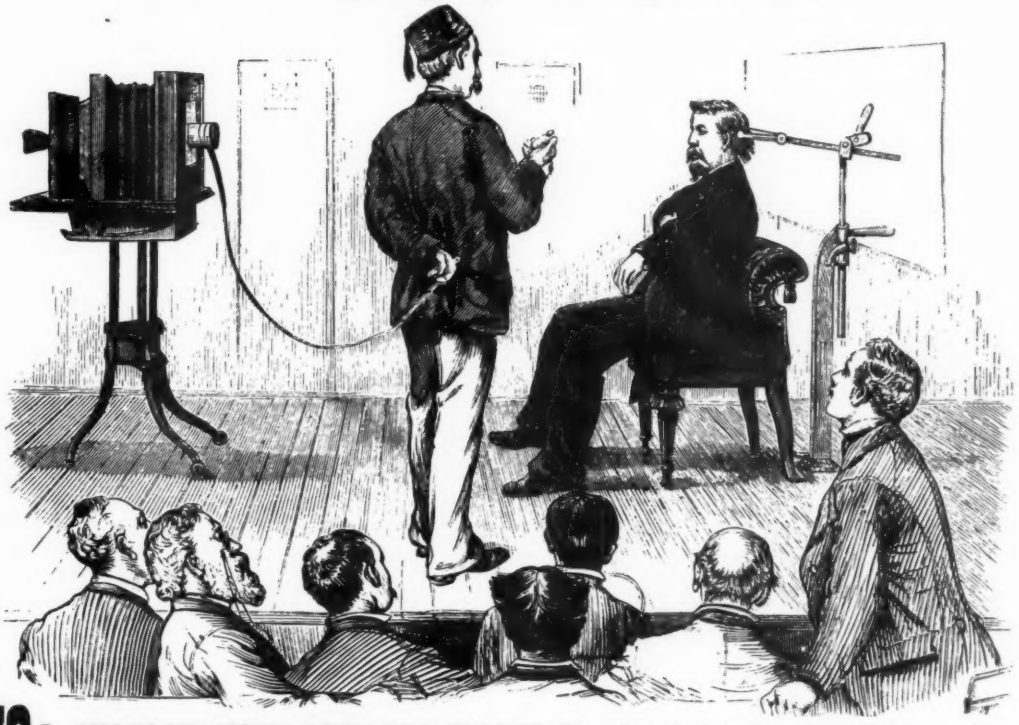
Before considering unitization it may be well to review some basic concepts in microfilm reproduction. Most microfilm begins as roll negative. For some applications as in the case of a department store billing operation, the negative can be used in a reading machine and will last long enough for the purposes intended. At the other extreme, an archival negative of valuable records must last indefinitely. Archival negatives should never be used for any purpose other than the making of use prints. In fact it is good practice to consider reserving any important negative for security and for the preparation of duplicates on film or paper. Except for machine-fed microfilm, all negatives involve hand labor and are consequently expensive. Negative film costs more than positive, and if the records are destroyed after filming the negative becomes unique. Contact prints may be made on silver, diazo or Kalvar film, on paper or many other bases including metal. Enlargements may be made on conventional photographic paper, on diazo and by several processes of electrostatic printing. Negative specifications by the way may vary slightly depending on the process to be used in making prints. Finally, when full rolls do not meet particular requirements, consider unitization.

Methods of unitization are almost infinitely varied but they depend basically on two formats, the insert card and the unit mounted card.

The insert card or jacket provides a sleeve of transparent acetate into which a frame or strip either singly or in combination is inserted. An ingenious machine has been de-

(*continued on page* 91)

"The Legacy of an Infant Art"



1879: **PHOTOGRAPHING WITH DRY PLATES.** The sitter had to be suspended in an immobilizer, since the exposure time varied from between one and several MINUTES.

1959: **PHOTOGRAPHY BECOMES A TRUE ART FORM.** The New York Metropolitan Museum has its first Photo Art Show and the professional photographer is elevated to the rank of artist.

No longer handicapped by the antiquated equipment of his heritage, he can concentrate his superior technical know-how and artistic talents completely on his subject matter.

Equipped with a modern precision camera that can provide a degree of versatility and operational simplicity unavailable to photography's early pioneers, he can fulfill his legacy—achieve optimum artistic quality.

SINAR ONE VIEWCAMERA FOR:

- **ANY JOB: The SINAR STANDARD,** basic camera, with its unique "Construction-unit" principle, can easily be adapted to any photographic assignment.
- **ANY FORMAT:** Change of backs and bellows (or reducing adapters) rapidly converts the SINAR to any one of 5 formats: 8x10—5x7—4x5—2¼x3¼—2¼x2¼".
- **ANY LENS:** Completely collapsible wide-angle bellows, short (6") optical bench tube and unlimited extension allow the use of extreme wide-angle (47mm Super-Angulon) and telephoto lenses (800mm or more!)
- **ANY ADJUSTMENT:** Unlimited rise and fall, 90° tilts, 3" left-right shifts, 30° side swings and complete camera swivel around optical bench.
- **ANY SPECIAL APPLICATION:** SINAR accessories permit—ultra close-ups, copy-work, microphotography, color separation, trick shots, multiple exposures, 45° angle pictures, etc., with minimal effort.
- **ANY-WHERE:** Lightweight, compact and completely collapsible precision construction for convenient portability and instant set-up on location.

Visit your franchised SINAR dealer (partial list below) or write for free illustrated brochure PMS-9

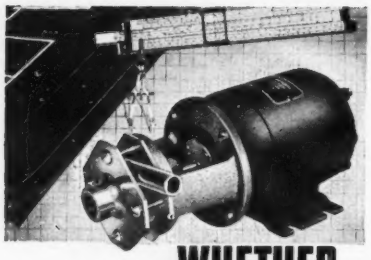
CALIFORNIA	THE HARDWOOD CO.	1141 W. Valley Blvd., Alhambra
	GARDEN & WILLIAMS	601 N. La Brea Ave., Hollywood 36
	GORDON ENTERPRISES	5362 N. Cahuenga Blvd., N. Hollywood
	BROOKS CAMERA	45 Kearny, San Francisco
COLORADO	J. A. OSSEN CO.	2144 Welton St., Denver
DISTRICT OF COLUMBIA	BAKER'S PHOTO SUPPLY	4611 Wisconsin Ave., NW, Washington
MICHIGAN	GARRICK'S PHOTO SUPPLY	3166 Cass Ave., Detroit
MISSOURI	STANLEY PHOTO	106 N. Broadway, St. Louis
MINNESOTA	CENTURY CAMERA SHOP	26 So. 7th St., Minneapolis
NEW YORK	ROYALTONE CAMERA	245 7th Ave., New York 1
PENNSYLVANIA	FOTOMART, INC.	8 S. Sixth St., Philadelphia 6
TEXAS	PATTERSON PHOTO SUPPLIES	113 E. Main, El Paso

From $349.00

karl heitz Inc.

480 LEXINGTON AVE., NEW YORK 17 • YUkon 6-4920

Get more information. Circle 439, page 81



WHETHER
YOU ARE PLANNING
A NEW LAB...
...OR
REPLACING
A SINGLE
UNIT

The same careful planning that goes into Fisher processing equipment is available to you in the form of a modern laboratory design service.

FISHER laboratory technicians carefully analyze the specific needs of your operation and follow through with sketches and recommendations that will enable you to produce more rapidly — at a lower cost without adding personnel to your staff. Typical examples of Fisher design efficiency are: the compact, light weight centrifugal pump (pictured above) and the stainless steel processing sink (below).

No obligation on your part . . . costs you nothing for this service. Write today for the Fisher Job Layout Design questionnaire.

The Fisher line includes processing machines, processing sinks, tanks and trays, controls, regulators, mixers, washers, dryers and many other products that help to make photo processing a better more efficient industry.

PROCESSING SINK
WITH
TEMP. CONTROL

Stainless steel sinks for every job on spacious heavy duty cabinets (sink body is removable) or on sturdy angle girder type legs. Sinks are welded by the continuous seam, Heliarc method. Heavy type "316" stainless steel is fused to itself eliminating any electrolytic corrosive action. Other features include: Curve-cleen corners, Die sumped drain outlet, Syphon drain, Adjustable leveling screws insulating undercoating. All sizes, length width and depth available. Prices on request.

OSCAR
FISHER
COMPANY, INC.
NEWBURGH, N.Y.

Get more information. Circle 432, page 81

by Herbert P. Paschel

REPRODUCTION & GRAPHIC ARTS

Direct printing plates with gelatin relief; other research news

The idea of applying the relief-forming properties of gelatin to producing halftone printing plates appeals to one's sense of efficiency. Though not new, the process has aroused some recent interest.

The Filmklischee process for example—first introduced in Germany about 30 years ago and later modified and improved—finds considerable application in Europe today. There are only a few steps in the process. The operator exposes the film, a silver-gelatin emulsion on a plastic base, under a halftone negative. He develops and fixes the film, then immerses it in a special bath to produce the relief. When dry, the film mounts on a suitable plastic or metal base and is ready for the press.

A similar idea is the subject of an American patent (#2,709,654), the Guth plate, which comprises a dichromated gelatin coated on a metal base. Exposure alone creates a tanned image. The relief is obtained by subjecting the plate to heat under rigidly controlled conditions. The exposure and heat treatment may be combined in one operation or covered in separate steps. The Guth plate may be used for direct printing, for stereomat preparation or as a mold for a cast metal relief plate.

An experimental relief printing plate was recently demonstrated at the Kodak Research Laboratories to the visiting members of the Technical Association of the Graphic Arts. Material for the process is a soft gelatin light-sensitive emulsion coated on a plastic metal laminate. Following exposure under a line or halftone negative, the plate is processed with a tanning developer which hardens the exposed areas. A brief rinse in warm water removes the unhardened, non-image portions of the coating. The gelatin relief image thus formed serves as a stencil for the next treatment. A solvent specific for the plastic base is swabbed over the plate. This simulates the etching operation of conventional photoengraving and increases printing depth. Following an alcohol rinse and drying the plate is ready for press mounting.

All of the operations so far outlined take less than five minutes. According to Dr. Staehle, the research scientist in charge of the project, in its present stage of development the plate is satisfactory for letterpress halftones. In view of the shallow depth so far obtained, line plates for letterpress offer several problems. But for dry-offset, line, halftone and combination plates have given extremely satisfactory, trouble-free results of high image quality.

The Kodak plate differs from the other two in that total relief, or depth, is a combination of the gelatin stencil and the relief which has been solvent-etched into the plastic base.

New pre-sensitized plate

A pre-sensitized offset plate reported to have exceptional press durability was recently perfected in Britain and introduced commercially by Algraphy, Ltd. The ARnEM plate is claimed to have significant advantages over the usual diazo pre-sensitized plates. The coating employed is a light-sensitive resin which not only has a high degree of ink-receptivity but, being physically tougher and of greater thickness, better withstands wear during the press run. Under ideal operating conditions press runs in excess of 100,000 impressions have been obtained. Processing following exposure (under a negative) is relatively simple. One solution poured over the plate removes the unexposed coating, stains the image to make it more visible and desensitizes the background (non-image) areas. The base metal of the plate is aluminum on which has been created a very fine anodized grain. This provides both a tooth for anchoring the image and a surface which holds moisture and re-

(*continued on page 22*)

In ten minutes you can prove... HUNT ENGRAV-O-GRAPH will give you *sharper and cleaner* halftones and tints

Engrav-O-Graph Developed Negative

Unretouched photomicrographs (magnified 150 times) of two halves of a test film exposed through a 133 line screen

"X" Brand Developed Negative

of a standard gray scale. Both halves were developed for 2¼ minutes at 68°F. Note the complete absence of halation in the film developed in Engrav-O-Graph.

Make this simple test

1 Order a carton of Engrav-O-Graph, on the money-back guarantee. Make up a solution according to directions.

2 On your next camera job, shoot an extra negative for your test.

3 Cut the negative in half, notch for identification, then run one half through your regular developer, one half through the Engrav-O-Graph developer. Keep time and temperature the same for both developers.

4 Fix and dry both test strips the same way. Then rejoin the negatives on your light table and examine the dots in identical areas with the most powerful magnifying glass you have. The microphotographs above show you what to look for. Notice that the shadow dots are harder, the highlight dots are cleaner and sharper in the Engrav-O-Graph developed portion of the negative.

MANUFACTURING CHEMISTS · QUALITY CONTROLLED · HUNT · CHEMICALS · ESTABLISHED 1909

For superior results around the clock use Hunt Graphic Arts Chemicals

PHILIP A. HUNT COMPANY

PALISADES PARK, NEW JERSEY

BRANCHES IN PRINCIPAL CITIES

In Canada: Philip A. Hunt Company (Canada) Ltd., 77 Leslie Street, Toronto

Get more information. Circle 448, page 81

Before you wash another print . . . check the automatic

calumet print washer

Just set the timer . . . it fills, starts, washes automatically

Gentle, safe, thorough . . . and so economical to operate

Handles all sizes up to, and including 20″ x 24″

Speedy, durable, compact . . . easy to load, easy to unload! Prints come out clear and clean because the Calumet washing action keeps them separated and in constant motion. As the inner sink rocks gently, a motor-generated wave of water moves from one side to the other. The water moves upward, too, thru a perforated false bottom within the inner sink. Your prints are lifted free in the actively moving water, each apart from the others. It uses SMALL amounts of water, changing it continuously. And it speeds washing decidedly.

Takes up to 125 prints (8 x 10) at one loading

Saves time . . . saves water

Write for your Calumet Catalog today

Calumet "P"

MANUFACTURING COMPANY, 6550 N. CLARK ST., CHICAGO 26, ILL.

Manufacturers of Cameras, Photographic Processing, Studio and Laboratory Equipment

Get more information. Circle 416, page 81

GRAPHIC ARTS

(*continued from page 20*)

sists oxidizing. The plates at present are available only in sizes for the small duplicator type presses.

Kodak Ektalith process

From Eastman Kodak comes the announcement of a new platemaking process intended for short-run offset duplicating. Although called the Ektalith process it is in reality an extension of the Verifax reflex photocopying system. The heart of the Verifax process is a special matrix material consisting of a soft gelatin silver emulsion on a paper base. Following a conventional reflex exposure and single solution processing an offset plate is created simply by squeegeeing the developed matrix together with a special paper offset master in a registering transfer device. Upon separation a layer of the gelatin image from the matrix remains attached to the offset plate to form an ink receptive image.

The Ektalith and Verifax processes are based on exactly the same principles and follow the same basic operations. The Ektalith material, however, is camera speed and can thus be exposed in any process camera at the same rate as conventional line films. This affords the opportunity to apply the process to all kinds of copy, plus the advantages of enlarging and reducing. (Verifax limits reproduction to a 1:1 ratio.) Optical copying increases image definition substantially over that of contact reflex copying.

Masking scanner

A device with interesting potential currently being studied at the Kodak Research Labs is a rotary "masking" scanner. This instrument has been designed expressly for the production of color-correcting masks from a set of conventional tri-color separation negatives. The three negatives, on film of course, are wrapped around a transparent cylinder which is illuminated from within by a fluorescent tube. The negatives are each scanned separately but simultaneously and the signals thus generated are fed to an analog-computer. Other circuitry establishes the signal that actuates a glowlamp for exposing the masking film which is attached to the end of the cylinder encased in a lightproof housing. A separate scanning cycle is required for each mask needed. The masks thus produced are registered with the appropriate negatives from which the corrected positive images are then made. (*continued on page 59*)

"WE GET THE ULTIMATE IN PICTURE QUALITY every time when our photographers shoot with CRONAR* Press and have their pictures printed on Velour Black®."

—L. L. Bunning, Chief of Photographic Department, Aerojet General Corporation, Azusa, California

Aerojet is one of the nation's outstanding research and development specialists in rocket propulsion. Their photographic schedules call for approximately 2000 negatives and 15,000 prints per month.

Mr. Bunning says, "About 85% of our shooting is done on 4 x 5 film and our choice of CRONAR Press gives us the advantage of virtually unlimited applications. A cameraman can load up and go out on an assignment without the faintest idea of what he will be required to shoot. Yet, he can have complete confidence that his negatives will permit excellent coverage of practically any situation.

"Our printing papers are almost exclusively Du Pont's, too, with 'Velour Black' supplying all our needs in projection material. These Du Pont products help us produce the best pictures we can possibly get."

Darkroom technician J. C. Weirich examines a print on "Velour Black" — one of 15,000 enlargements made every month.

Find out more about this increasingly popular photographic team: Du Pont CRONAR Sheet Films and Du Pont Photographic Papers. Contact your Du Pont Technical Representative for a demonstration. E. I. du Pont de Nemours & Co. (Inc.), Photo Products Department, Wilmington 98, Delaware. In Canada: Du Pont of Canada Limited, Toronto.

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living
... through Chemistry

*Du Pont's trademark for its polyester photographic films

This advertisement was prepared exclusively by Phototypography

Get more information. Circle 427, page 81

LEKTRA LAB
DENSI-COLOR ANALYZER

saves time and money *SIX WAYS* while doing a better job:

1. Reads 3 colors simultaneously.
2. Scans each color, and indicates proper CC filters to use for correct color balance.
3. Indicates proper aperture opening of enlarger.
4. Indicates time of exposure.
5. Makes exposure if desired with available built-in timer (or data may be transcribed on envelope for printing elsewhere).
6. Gives a quicker, better color print ON FIRST EXPOSURE!

MODEL PTM 6

CONTROL CONSOLE
TELLS PROPER COLOR CORRECTION FILTERS TO ADD OR REMOVE FOR CORRECT COLOR BALANCE.

OPTICAL HEADS
Large head which is for color balance only, swings over and above the easel. Reads RED — GREEN — BLUE simultaneously. The small head reads the amount of color-balanced white light hitting the paper and exposure in seconds is indicated on the exposure meter of the operator's console.

For further information write:

LEKTRA LAB., inc.
Manufacturers and Developers of Electronic Equipment
154 Eleventh Ave. • New York 11, N.Y.

Get more information. Circle 461, page 81

by Samuel Lang & Leonard Zoref

INDUSTRIAL COLOR

More remedies to help correct improper processing procedures

Last month we left off with Ektachrome accidentally processed as black-and-white, describing the Ektacolor technique of saving the film through C-22 solutions. The following are further steps that can be taken to save the Ektachrome with E-1 or E-2-3 chemicals: After the 15-min. wash, put it in the Ektachrome E-1 or E-2-3 bleach (depending upon the type of Ektachrome) for 8 min. at 75°F. The Ektachrome will have practically no image at the end of this stage. This does not indicate the loss of negative. The film should then be washed again for 15 min. and exposed to a strong white light. This is done to re-expose the re-sensitized silver salts. The film is now placed in its proper color developer, E-1 or E-2-3. After several minutes the color negative image will start to form. You can practically develop now by inspection. If the negative image was normal to begin with, the full developing time of 15 min. may be necessary. The processing is continued in the Ektachrome solutions in the normal manner. This negative will now render fair to good color prints or transparencies. It is now suitable for black-and-white printing also. This is because the yellow filter layer has been entirely removed by the above procedure.

In addition to making the Ektachrome into a color negative as described above, it can be used directly to make black-and-white prints on Panalure paper without further treatment. Panalure should be used because the Ektachrome will still have its yellow filter layer in it. As the paper is sensitive to all colors, the filter layer should not affect it greatly. When the negative is used in this state to print on ordinary black-and-white paper, the yellow filter layer will act as a safe light and allows very little white light from the enlarger to reach the paper. In the event that standard black-and-white printing paper is used it is necessary to remove the filter layer by following these steps: Dilute the normal Ektachrome bleach 10:1. After washing the film for 5 min., place the film in diluted bleach for 1 min. agitating continuously. Next place it in Ektachrome fixing bath or regular hypo for 3 min. If the yellow filter layer is still present, repeat the above process for as many times as it is necessary to remove it. This will also bleach the silver image to some extent which in most cases will not harm the negative. This procedure results in a true silver image negative. We feel that the previously described steps using C-22 to re-develop the Ektachrome to a color negative will give better results in most cases than E-1 or E-2-3.

Ektachrome in Anscochrome

To pull this out of the fire again requires sharp eyes at the reversal stage. Unlike black-and-white or Ektacolor ready for reversal the Ektachrome will not be very different from Anscochrome. In order to get good reversal of color films the developing hangers should be tilted from side to side. This should allow you to catch a glimpse of the notching code of the film. This is good S.O.P. practice when processing any color film. When the error is discovered in reversal the film is simply separated, washed for 4 min. (gradually increasing temperature from 68°F to 75°F), and then continuing in the proper Ektachrome solution. The results should be a near perfect color transparency. If the Ektachrome is allowed to continue through the Anscochrome solutions you will most likely obtain a greenish transparency due to the dissimilar color developers.

Anscochrome in Ektachrome

The same procedure is used as with the vice-versa error described above. The exception is that extreme care must be taken to lower the wash

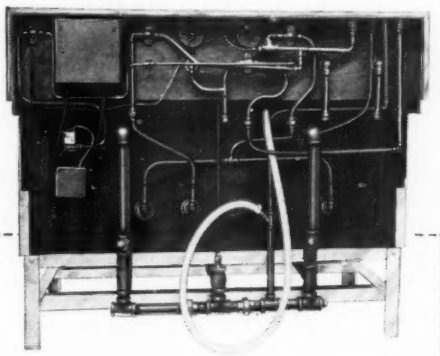
(*continued on page 26*)

BAR-RAY always highest in quality

now lowest in price!

New, smaller, more compact color processor, designed as a lower priced companion model to the Bar-Ray #1830 Processor.

Compare the Bar-Ray price list on this model #1863 Type "C" Processor with any other



**

Complete plumbing, gas lines and electrical work is factory built and tested when complete system is ordered. Installation at your plant requires only connecting to hot and cold water, drain and power.

Write for information on special processing equipment for Agfa, Ansco, DuPont and Kodak processes (including the new Ektachrome E-3)

PRICE LIST

SINK			**$1,624.00**
Plumbing Fixtures:			
4	#1316	Shut-off Valves for water and gas @ $12.00	48.00
1	#1862	Hose Bibb	18.00
2	#1842	Automatic Gas Feed Ports @ $48.00	96.00
1	#1861	Top operated Dump Valve	48.00
1	#1860	Suction Drain Hose Assembly	36.00
1	#1315	Leak Proof Vacuum Breaker	16.00
1	#1109	Variable Temperature Thermostatic Control Valve	124.00
		Alternate: For a fixed temperature control, omit #1109 and substitute:	
	1 #1566	Positive Temperature Control Valve	$57.00
	1 #1579	Vacuum Breaker	10.00
			$67.00
ALL INTER-CONNECTING PLUMBING			**NO CHARGE****
Accessory Items:			
2	#1501	Dial Indicating Thermometers @ $24.00	48.00
1	#1859	Interval Timer	24.90
1	#1838	Gas Burst Control (interval, duration and pressure)	140.00
1	#1856	Basket (Capacity: six 16x20 prints)	148.00
6	#1849	—3½ gallon Stainless Steel Solution Tanks @ $48.00	288.00
1	#1850	—3½ gallon Red Brass Bleach Tank	60.00
1	#1858	Wash Tank, fitted for Quick Dump Device built into the sink	68.00
		TOTAL	**$2,786.90**

WRITE FOR LATEST CATALOG — **SOLD THROUGH FRANCHISED DEALERS**

You are cordially invited to visit our plant and tour its facilities

BAR-RAY PRODUCTS, INC.

209-25th Street, Brooklyn 32, N.Y. Telephone: SOuth 8-1020

Get more information. Circle 404, page 81

ROLOR DAYLIGHT
ROLL PAPER

color print processor

Ideally suited for school, police and industrial color finishing. Unique features include: automatic progressive lights, integral gas agitation and automatic replenishment systems.

MODEL PF-1

- Processes multiple 20 foot lengths in widths up to 8 inches
- Complete daylight operation
- Up to 1,000 small prints per hour
- Economical . . . uses only 3½ gallons of chemical

Send for literature or contact your nearest Rolor dealer.

ROLOR® INDUSTRIAL CORPORATION

Camera Craft Building
18 E. 42nd St., New York 17
YU 6-5194

Get more information. Circle 487, page 81

A new high in Versatility and Precision!

MIRANDA
Model 'C'...Fully Automatic

MIRANDA 'C' is the parallax-free, vibration-free single-lens reflex with every modern camera feature. Newly computed, ultra-sharp 50mm f/1.9 lens; instant-return mirror; 1/1000th shutter; universal bayonet *and* screw mount which adapt to more than 200 lenses—all combine to provide unmatched versatility for industrial-professional photography. Full complement of fine accessories. Surprising low price at only $279.95.

Write for free MIRANDA booklet to Dept. PM ALLIED IMPEX CORP.
300 Fourth Avenue, New York 10, N. Y. • Chicago 10, Illinois • Los Angeles 36, California

Get more information. Circle 451, page 81

INDUSTRIAL COLOR

(*continued from page 24*)

water temperature to 68°F. The wash should take 7 min. so that you can lower the wash gradually 1° per minute. As you can see, Anscochrome film is much more susceptible to temperature fluctuations and is liable to reticulate and frill if not handled carefully.

Anscochrome in black-and-white

The same technique described for Ektachrome in black-and-white should be followed. Start with Anscochrome bleach and continue as directed in the Anscochrome solutions. One word of caution, do not attempt to run through the C-22 line as the color couplers are not compatible. The end result should render an unmasked color negative. The printing procedure is the same as described in last month's column.

Kodachrome in b&w or color

When this faux pas occurs it is hopeless to try to obtain either a color negative or transparency. This is due to the fact that there are no color couplers built into the film. The best that can be obtained is a black-and-white negative. If color is absolutely necessary, the negative can be used to make a flexichrome matrix and colored in the usual way.

The Kodachrome can be spotted quite easily during reversal due to a black antihalation layer on the back of the film. There should be some traces of it left during reversal. In proper Kodachrome processing this is removed in a pre-developing bath and then scrubbed off.

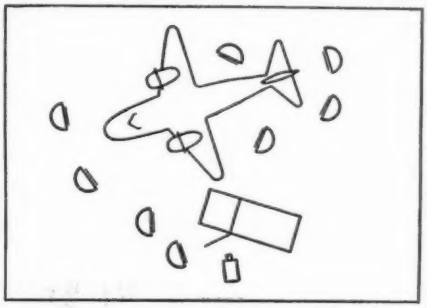
The negative should be hypoed in the standard manner. The yellow filter layer is then removed in the same way as described for Ektachrome in black-and-white.

The salvaging of the erroneously processed film can be put to another good use. We have recently heard of an organization on an expedition in the wilds of Africa that could not find a convenient processing station or post office nearby. The heat and moisture normally would have played havoc with the latent image of reversal color films. They then processed their Ektacolor and Kodacolor in black-and-white. In this way they were able to judge exposure and sharpness. Months later the negatives were reprocessed in the C-22 solutions here in the states and rendered fine color prints and transparencies. The exposures were balanced for the particular temperature of the developer that was used on location.—THE END.

PHOTOGRAPHER J. M. HESLOP CAPTURES DRAMATIC NEWS SHOT WITH G-E No. 22 FLASHBULBS

"It was during a heavy snowstorm," relates Chief Photographer J. M. Heslop of the Salt Lake City DESERET NEWS. "On landing, a plane had skidded and crashed into an automobile as it traveled along the highway near the Salt Lake City airport. My problem was how to get the whole picture in the heavy snow and darkness.

"I decided to use the double focus technique and walk-around flash. With my Speed Graphic 4 x 5 on a tripod, I focused first on the car. Two exposures were made at open flash f/11, using a single G-E No. 22 bulb each time (see diagram). Then I refocused on the plane, making six open flash exposures at f/11, again with a single G-E No. 22 each time. Thanks to these reliable bulbs, I had the extra coverage I needed."



HAVE YOU SOLVED a difficult or unusual lighting situation with General Electric Flashbulbs? Send your picture with a detailed description to: Photo Lamp Dept., General Electric Co., Nela Park, Cleveland 12, Ohio. General Electric will pay you $50, if your story is accepted, for the privilege of telling it in their advertising in the professional photographers' magazines.

GENERAL ELECTRIC

Get more information. Circle 435, page 81

'PHOTO-EYE' THE FUTURE . . . AT S.P.S.E. '59, CHICAGO!

Forward-looking reports on subjects ranging from military photography and data handling to latest camera and processing systems will be covered in a record number of eighty technical papers scheduled for presentation at the 1959 National Conference of the Society of Photographic Scientists and Engineers in Chicago, October 26 to 30.

Opening sessions at the Edgewater Beach Hotel will include reports on space photography, photo-optical instrumentation for missiles, aerial reconnaissance systems, and special purpose equipment by experts from Patrick Air Force Base, White Sands Missile Range, Cornell Aeronautical Laboratory, and Signal Corps Laboratories.

A major display of technical equipment will represent the nation's leading photographic and electronic manufacturers. The Department of Defense has approved display of service exhibits from commands in the vicinity.

Paper sessions will also have reports on design and operating features of aerial, multiflash, high-speed, and instrumentation cameras and technique. An evening meeting on data handling will cover photographic aspects of computer memory, optical scanners, and photoelectronic information storage and retrieval.

The Bureau of Standards will give a demonstration of color perception with abridged color-projection systems.

Important papers on sensitometry, tone control and special effects, speed and exposure, image structure, sensitization, processing, and apparatus will be presented at sessions during the week-long conference. A nationally known scientist will speak at the annual banquet on Thursday, Oct. 29.

International interest in the 1959 conference is reflected in papers to be presented by photographic authorities from Belgium, England, Germany, and Japan. The SPSE is the principal photographic technical society in the Western Hemisphere and cooperates with other technical societies in advancing engineering applications of photography as well as its fundamental science.

1959 National Conference
SOCIETY OF PHOTOGRAPHIC SCIENTISTS AND ENGINEERS

for more information, write:
Registration Chairman,
Joseph Mangiaracina
30 Brook Avenue, Little Silver, New Jersey

by Edward R. Farber

ELECTRONIC FLASH

PPofA sees new equipment, Ansco color film for electronic flash

The Professional Photographers of America have for years convened in Chicago's July swelter. But this year they shifted to Los Angeles. The welcome had not cooled in the least, and I pass along the following as hot news.

Dr. Harold E. Edgerton received the PPofA's highest honor, the George W. Harris award, for his contributions to the world of photography, particularly in the development of the stroboscope and electronic flash. As he received the award, Edgerton smiled warmly, wiped his flushed brow, received warm applause and said he was honored to be classed with such previous recipients as General Goddard and Edward Steichen.

Super Anscochrome 6500

Between goings on, Ansco announced a new Super Anscochrome color film, balanced for use with electronic flash. Crisp, brilliant images of outstanding color fidelity are made possible by tailoring the film to the short duration and 6500K color temperature of electronic flash. As one might expect, no filter will be recommended for use with the film, though filters might be needed under special circumstances.

The exposure index of the film will be about 100. Typical guide numbers would be 85 with a 100-watt-second unit having an 1800 BCPS rating—or 420 with a 2500-watt-second unit with a BCPS of 45,000. The grain pattern is said to compare favorably with e.i. 32 Anscochrome.

The film will be available in the fall, but only in standard sheet sizes (2¼ x 3¼ to 11 x 14) at the outset.

Graduating with color

If proof is needed, no more convincing evidence that color has arrived can be found than the appearance of numerous high school annuals with the pictures of the graduating class in full and glorious color.

The increasing use of color in studio and school portraiture has prompted two manufacturers to introduce voltage-regulated power packs, with reasonably rapid recycling to team up with automatic portrait cameras.

At the PPofA Exposition, Schiebe Engineering of Burlington, Wis., showed its new 400-watt-second Golden Starlighter studio unit which is complete with a four-section air-cushion stand and caster base. The output of the unit is variable at 25, 50, 100, 200 and 400-watt-seconds. Recycle time runs from 1½ to 6 sec. at 200WS to 12 sec. at 400-watt-seconds. Voltage on the capacitors is automatically maintained at 450 by a series of voltage regulator tubes, even if the line voltage varies from 100 to 130 volts. No controls or meters are needed.

Photogenics' automatic models are AC "portable" of 300 and 400WS. Respectively they weigh 14 and 16 lbs.; have a recycle time of 3 and 4 sec. Each will handle up to four lights with various watt-second combinations. Capacitors and other components are plugged into the chassis. Thus, should trouble occur, they can be replaced with spare parts immediately.

Bright ideas from Ascor

The American Speedlight Corp. has done a commendable job of redesign so that all accessories and lamps of the Ascor series 400 portable units are interchangeable with the series 500 studio units.

New literature to cover these units has been prepared. It is complete and easily understandable. To this writer, in fact, it is the most detailed and lucid description put out by an electronic flash manufacturer. Ascor President Harry Parker explains ". . . when it got so that even I had trouble understanding it, I decided to do something about it." He did.

Ascor also showed a new No. 614 power pack which is a 900-volt, 19-

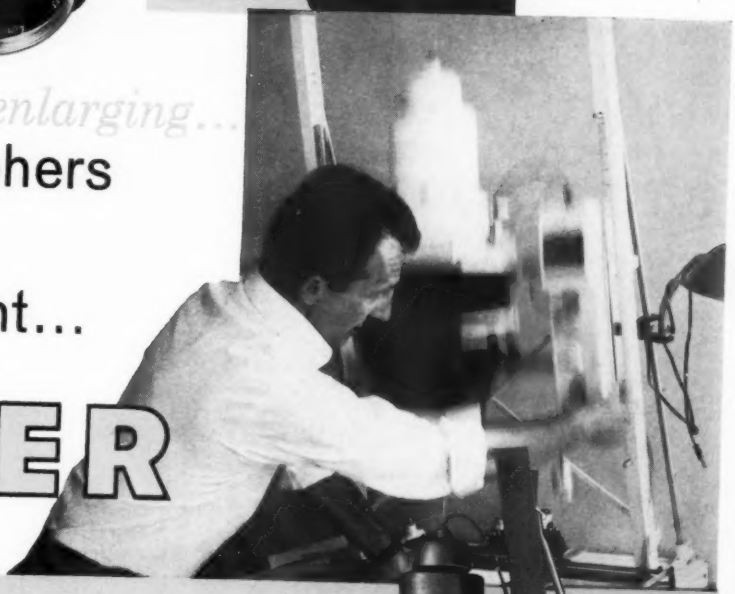
(*continued on page* 59)

from shooting...

to enlarging...

great photographers depend on great equipment...

BESELER



the photographer . . . **Jean-Ph. Charbonnier, one of Europe's great photo journalists, staff photographer with world-famed Realités magazine. winner of world-wide acclaim.**

the camera . . . **Beseler-Topcon, one of the camera industry's greatest achievements, 35mm single-lens reflex with razor-sharp Topcor lenses. With 58mm f1.8 or 35mm f2.8, $295.**

the enlarger . . . **Beseler 45MCR-X, great contribution to enlarger design, offers most versatility, highest quality construction, push-button motorized action. $309 (Denver West $318).**

CB

See lifetime guaranteed BESELER products at your Beseler Dealer, or write for complete literature

Charles Beseler Company, 219 S. 18th St., East Orange, N. J.

©1959, Charles Beseler Company

Get more information. Circle 407, page 81

More Light...
More Features
Than Ever!
NEW
SUN-LITE
HI-PRO
(MODEL M)
ELECTRONIC FLASH UNIT
BY HERSHEY

6" x 6" x 6"

New speed and convenience are built into this latest heavy duty professional flash unit, the Model M HI-PRO. In addition to 150 watt-seconds, 4000 BCPS, Kodachrome Guide No. 90, it has a modeling light, 6-second recycling time, and can be shutter tripped or slave operated with built-in photocell. Use the Model M everywhere . . . 110 V AC, 60 Cycle, weighs 4½ lbs. **$109.95**

STANDARD HI-PRO: Same as above but less modeling light **$89.95**

TIME SAVING HI-PRO ACCESSORIES

BARN DOORS: Easily attached to any Hi-Pro. Full 360° rotation. Controls light pattern.

SWIVEL BRACKET: For all Hi-Pro's—Many other uses.

LIGHT STAND: Completely collapsible—Sturdy, well built for hard use.

Some choice territories available for Manufacturers "Reps."

WRITE TODAY for literature . . . nearest Hershey flash supplier.

HERSHEY MFG. CO.
4325 West Lake Street
Chicago 24, Illinois MAnsfield 6-2612
ELECTRONIC FLASH EXCLUSIVELY!

Get more information. Circle 443, page 81

by David B. Eisendrath, Jr.

WORKING PHOTOGRAPHER

Some comments on how to remember when to push, pull and click

Now that almost complete automation has been incorporated into camera design, what with the built-in photocells that not only measure the light falling on the subject but set the aperture, too, I am just waiting for someone to hit the amateur market with a *motif-finder*. This would be a device that would ring a bell or wave a flag when a suitable *motif* appeared in front of the camera. The only thing that would be left for the photographer to do would be to make a decision as to whether he wanted to capture the *motif* for posterity.

Although photography seems to be getting simpler for the amateur, the poor professional has more things than ever to remember. Most photographers who have been in the field as long as I have would agree that we could all retire if we had a nickel for every exposure we've made on a dark-slide we'd forgotten to pull out. Remembering the full routine is sometimes as difficult as remembering some of the seldom used data that you always need when you are miles from reference books.

Slide stuff

Of course the remember-to-pull-the-slide bit didn't always happen. Years ago the Kalart people designed a camera with an interlock switch in it and you couldn't fire the shutter unless the slide had been pulled. I've always regretted that this camera died an untimely death, largely because its design was not accepted by the pros who should have designed it themselves. The Leica people were pioneers in helping photographers to remember with their single wind mechanism that advanced film and wound the shutter. Later they were among the first to equip cameras with small dials to remind the photographer what kind and speed of film they had in the camera.

Another stunt to remind one to pull the slide is one my friend Bob Hutchinson of St. Louis (a top-notch architectural photographer) showed me for use with film packs. Often when shooting with film packs one often forgets to pull the safety tab of the first protective sheet or, having pulled the tab, forgets to pull the dark slide which is then hidden by the black paper. Hutch has an "L" shaped hunk of brass riveted to the handle of the darkslide on his film pack adapter positioned in such a way that you *must* pull the slide before you can pull any of the film pack tabs.

I use a stunt on Graflex magazines where the black leather bag hides the slide. I put a strip of adhesive tape with a doubled-over end across the end of the slide and face of the magazine. The magazine won't go onto the camera unless the tape is removed, and I pull the slide at the same time. This also indicates whether the Graflex magazine is freshly loaded or has been exposed. Another stunt when using the Graflex magazine is to turn septum number 12 upside down (the number shows thru the peephole upside down this way, too). When you do this, you'll find that you can't change the last sheet of film; it gets down to the bottom of the magazine and won't go into the black leather bag. In this way you don't double expose the first sheet. Inasmuch as I use Graflex magazines often when I am working fast or need to make a series of pictures in a hurry, this tells me that I've made the last shot and prevents the losing of the first exposure by double exposing.

Coding film

Another technique that I use—and I'm sure other photographers do, too—is to code my holders or magazines with labels, colored tape, or color patches so you know what kind of film you have in each one. If your operation has been so simplified that you use only one type of film, you'll probably not have that problem and I'm sure you'll also have the envy

of most industrial photographers. I find myself normally carrying two kinds of color film and at least two kinds of black-and-white on the average assignment of a day's shooting, to say nothing of those occasional jobs where I also carry color negative, ortho black-and-white, and maybe something special like Royal-X or other high-speed stuff.

In the days before they were taken over by Graflex, SR (Strobo-Research) put out some handy film holder markers that were small adhesive labels imprinted with the names of every film generally used. Many people liked them, bought up all available when they went off the market and, like me, are regretting the fact that no good substitute has come along. What the pro needs is someone to remember to make reminders for him.

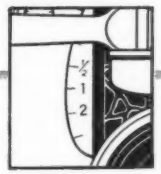
Another reminder that I use is a series of large bright labels that say "FILTER?" which I stick onto magazines and film holders in which I carry tungsten type color films. Usually I find myself making black-and-whites and color shots of the same subject, and I find this flashy label often saves me the embarrassment of making color shots with flash or flood and not having remembered to use a filter.

Memory jogger for trips

A good deal of the kind of photography that I do for industrial concerns entails long and involved photo assignments, where three days or three weeks is more often the rule than three shots. When involved in packing for trips of this sort, I try to think of all the things, accessories and gadgets that might be needed, and confess that I have a series of check lists to remind me of what to pack in various cases for various kinds of industrial jobs. Not only is there a check list glued or taped to the inside lid of most cases of equipment, but I jog my own memory with signs that say such things as: Coveralls? Sneakers? Safety Shoes? Helmet? Goggles? Towels? Boraxo? . . . and so on. Just so that in packing of cameras and films I don't overlook certain basic accessories. The check list in the case-lid is also a reminder in packing-up after the job to be sure that I have all the equipment packed or accounted for before I leave. Inasmuch as I often travel 1,500 miles to an assignment, it saves a lot of embarrassing letter writing to see if something has been left behind.

Maybe it's advancing age, but I always remember better when there is a memory jogger or reminder handy.—THE END

Get fades, lap dissolves with New Bolex 16 mm Reflex!



NEW Variable Shutter makes fades easy. Hand-backwinding for perfect laps, too. Even automatically timed fades with the exclusive Rexofader. Parallax ended by reflex viewing—no more figuring distance or worrying about focus. Just look and shoot! Speeds from 12 to 64 fps . . . footage and frame counters . . . settings for time exposure, single frame and continuous running. With Lytar 1" f/1.8 f.m. lens, the H-16 REX is $400.00. Lenses and Rexofader shown, optional at extra cost.

New 16 mm f/2.0 Reflex Zoom Lens with 5 to 1 Ratio!

Through-the-lens focusing and viewing—in the new Som Berthiot Pan Cinor "85" lens that zooms from 17mm to 85mm! Split image range finder, C-mount for 16mm cameras. $420.00. Write for literature and name of nearest Bolex dealer. Department PMI-9, PAILLARD Incorporated, 100 Sixth Ave., New York 13, N.Y.

BOLEX

Get more information. Circle 479, page 81

Better learning through eye and ear

NEW CATALOG!

Audio-Visual Tools for Teaching . . . for Selling from America's fastest-growing source of

Projectors • Files • Chemicals • Recording Tape Splicers • Editors • Accessories

Write Dept.

THE HARWALD CO.

1216 Chicago Ave., Evanston, Ill.

Better learning through eye and ear

Get more information. Circle 444, page 81

Clean Film the Modern Way

Edwal COLOR FILM CLEANER

—Anti-Static
—20 Times less toxic than carbon tetrachloride

Fast, Reliable, Economical

4-oz. 65c 1-gal. $8.25

Ask your dealer

Edwal Scientific Products Corp.
420 West 111th Street • Chicago 28, Illinois

Get more information. Circle 430, page 81

imitation is the sincerest form of flattery

and flattered we are that other laboratories sometimes use our registered trademark

color-correct®

is an industry standard to mean the finest quality in color duplicating.

color-correct®

is owned by Bryon, Inc., and is registered in the United States Patent Office under Trademark No. 575058. By law, we are required to protect our trademark by defending against all improper uses and infringements. So when these two words

color-correct®

are used together in reference to motion picture film, they apply to our registered process only—for only Byron has the right to use this term—only Byron can deliver **color-correct** prints.

byron

motion pictures

1226 Wisconsin Ave., N.W.
Washington 7, D.C. • FE 3-4000

1226 East Colonial Drive
Orlando, Florida • CH 1-4161

Get more information. Circle 414, page 81

by Arnold Eagle

INDUSTRIAL MOTION PICTURES

Projectionist, spare that film, a scream for scenes on screens

When a group of socially-conscious citizens finally organizes a very necessary association called the SPCFM (Society for the Prevention of Cruelty to Film Makers), the first and most painful cruelty they will have to deal with is the barbarism prevalent in the projection of 16mm motion picture film.

I would hate to make a guess about the percentage of sub-standard projection in the 16mm field. I am sure a good part of it would be branded "unfit for human consumption." More often than not, a film maker apologizes for the projection when he shows a 16mm movie. The image isn't bright, the focus is poor, the sound is garbled, all caused by inferior projection. His remarks may sound like alibis but the sorry fact is that they are, in too many cases, justified, as the following survey results indicate.

Survey shows sins

The Motion Picture Research Council recently concluded a two-year survey of movie theatres throughout the country. They discovered that 70 percent of them had sub-standard projection. The result of this finding was the formation of a council to improve theatrical projection, composed of such interested groups as the theatre owners, projectionists union and Society of Motion Picture and Television Engineers.

There is a question whether a great majority of the projectors used are capable of satisfactory projection, even when they are adjusted to their fullest efficiency and operated by experienced projectionists. Many of the projectors sold in the past were equipped with $15 lenses, designed by Petzval 110 years ago for use as a portrait lens. They are sharp only in the center because of the curvature of field; when focused on a screen, 5 ft. away the center may be sharp but the edges may be 2 ft. front focused.

The quality of an optical 16mm sound track is limited to start with because of the slow speed at which it travels and the grain structure of the film. Even under the best of circumstances a 16mm sound track can register only up to 8,000 cycles. This result can be obtained only under unusually happy conditions with first rate amplifying equipment and a loudspeaker which costs more than the price of an ordinary projector. Most portable 16mm sound projectors are fitted with dynamic cone speakers that cost about $5 each to manufacture. They are incapable of reproducing anything higher than 3,500 cycles.

This is not so bad. The ears of most people are not very highly trained and usually accept ordinary sound distortions as normal. Consider the various conditions which degrade quality of improvised projection: extraneous light, unsuitable screens, excessive projector noise, bad seating arrangements and, to top it off, inexperienced projectionists. They can make even the best sound track sound as if it had been recorded under water.

One wonders why a film maker trys to obtain a sharp, steady image, records on high fidelity equipment costing thousands of dollars, takes every precaution, only to have it all wasted by poor equipment and carelessness. This is why most professionals prefer to work with 35mm film. Projection equipment for 35mm is far superior to most 16mm equipment, although that in itself is no guarantee. Most organizations that show non-theatrical films have only 16mm projectors so that the film has to be reduced to 16mm leaving the film maker worse off than if he had started with 16mm.

Modern projectors good

The manufacturers of 16mm equipment are not falling down on the job. As a matter of fact, the past few years have seen some fine new equipment to overcome most of the

(*continued on page* 60)

Avco selects ARRIFLEX®!

THE CHOICE OF PROFESSIONALS ALL OVER THE WORLD

12th in a series

"ARRIFLEX SERVES AMERICAN INDUSTRY"

Avco's Research and Advanced Development Division selects Arriflex to record the progress of a data recovery program; another phase in carrying out Air Force contracts to produce re-entry vehicles for the intercontinental ballistics missiles Titan and Minuteman. The photographs show Arriflex cameras filming a test air-drop of an information capsule under development for use in ICBM re-entry vehicles.

Avco uses no less than six Arriflex motion picture cameras, both 16mm and 35mm. Some are in continuous, around-the-clock use, performing perfectly under the most exacting conditions imaginable.

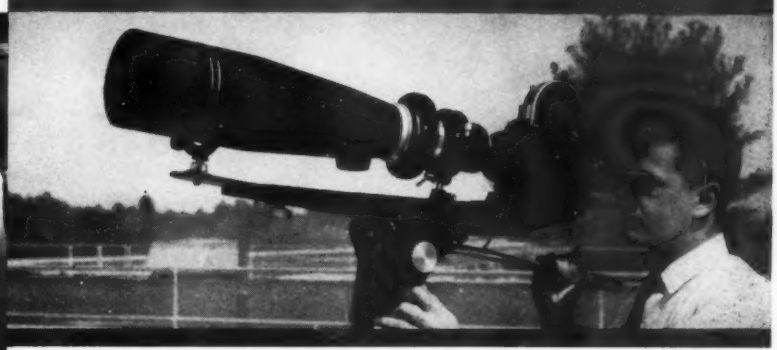
Arriflex, the world's most ruggedly reliable, money-saving production camera can perform equally well for you!

Arriflex 35 and foul-weather gear sported by Jack Philo during one phase of "data cassette program", in which a capsule in a test drop is recovered off Marblehead on the windswept New England coast. During critical experiments Arriflex motion picture cameras are in use 24 hours a day.

Here Jack Philo, Avco cameraman, uses an Arriflex 16 during "data cassette program" on Cat Island, one mile off Marblehead, Mass. That's a 32 inch telephoto lens mounted on the Arri. Avco cameramen carry the rugged ARRIFLEX wherever they travel in conjunction with this new data recovery development program.

Avco camerman Mel Miragliotta checks out telescope and 600mm lens alignment on his dependable Arriflex before leaving for the drop test site off Marblehead. The experiments were recorded from Cat Island, a lobster boat, and a high-flying plane. The one thing all have in common...an Arriflex aboard.

The Arriflex is used in-plant too. Here it is shown photographing new instrumentation in an environment test program. Through these films, the Air Force can evaluate Avco's progress on contracts to produce re-entry vehicles for Titan & Minuteman ICBM's.



Discover the reasons why the motion picture departments of leading companies and professional producers prefer the remarkably versatile Arriflex 16mm and 35mm cameras. Write for complete literature today!

ARRIFLEX CORPORATION OF AMERICA
257 PARK AVENUE SOUTH, NEW YORK 10, N. Y.

Get more information. Circle 402, page 81

The world-famous Hasselblad 500 C embodies experience and foresight

Standard lens is Zeiss Planar 2.8/80 mm with built-in Synchro-Compur shutter with EVS scale, speeds B, 1—1/500 sec, automatic and manual diaphragm control, movable depth-of-field indicators.

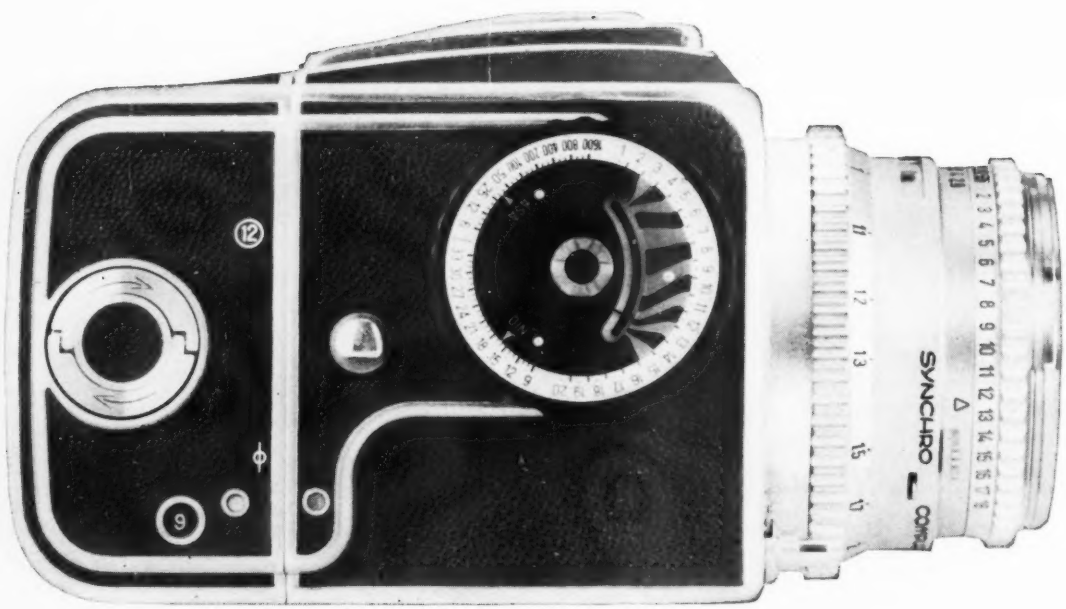
The same features are also provided on the three top-class accessory Zeiss lenses, Distagon 5.6/60 mm, Sonnar 4/150 mm, Sonnar 5.6/250 mm. Three interchangeable roll film magazines, $2^1/_4$"×$2^1/_4$", $1^5/_8$"×$2^1/_4$" and 2"×2" for 120 roll film.

The Hasselblad range includes many more worthwhile accessories, such as macro and micro units ● magnifying hood ● prism sports viewfinder ● knob with built-in exposure meter ● rapid winding crank . . .

Ask your franchised Hasselblad dealer for demonstration of the Swedish Hasselblad.

this is HASSELBLAD

Single Lens Reflex $2^1/_4$"×$2^1/_4$"



PAILLARD INCORPORATED, 100 SIXTH AVENUE, NEW YORK 13, N. Y.

Get more information. Circle 480, page 81

AN EDITORIAL

THE FUTURE STARTS TODAY

The other day an executive of a large industrial organization made a statement that stunned us. He said, "We don't use our photo department for people pictures." As you might guess from his idiom he is a public relations man. What he meant by "people pictures" was simply pictures of people. We inquired further into his company's use of photography. It ranges from an audio-visual program through metallographic photomicrography to X-ray diffraction crystallography. Who handles these esoteric branches of the art? Photographers and scientists who have nothing to do with the photographic department.

So it seems that this department, by no means a small, inexperienced or undernourished one, has very narrow shoulders. If a picture must be attractive enough to appeal to people, someone is called in from the outside. If it is of a technical nature—if the photographer must know something besides how to cock a shutter or jiggle hangers—the department is forgotten and an expert is hired. It would seem that as photography's contribution to industry grows wider and wider, the scope of this department grows narrower and narrower. All that is left to it now is documentation of the simplest sort and photofinishing.

The department is a veteran in our field, but it has failed to keep up with the times. Like a senile man, its present is pale and its future is dim.

A photographer who thinks he can be a whiz at every task may be kidding himself, but a photographer who thinks that he needs to be no more able next year than this year is deluding himself—perhaps right out of a job.

The Editors

SLIDE FILM PRODUCTION

Like any other medium of communication, the slide film (otherwise known as the filmstrip) is something to itself. To think of it as a paralyzed motion picture is to defeat its purposes; it is not a cheap substitute for films. It is a valuable instrument in training salesmen, selling service, demonstrating products, reporting progress and building public relations—when properly used. No article can teach an art, and making an effective slide film is at least partly art. The purpose of this article, on the other hand, is to discuss some of the points acquired from our experience with filmstrips, particularly the control of commercial color slide film production.

If you can forgive my being didactic, I would first like to give some rules of the game. I won't list any exceptions, because everyone knows their relationship to rules. The first rule is that careful script preparation, done with a good grasp of the medium avoids many pitfalls and enables the producer to sidestep the weaknesses of the medium (and any medium has weaknesses). Because they are static, people in these still pictures, should not enter into the dialogue. But to be wholly successful the narration and the picture must tie together, each one contributing to the progress of the other.

Usually the slide film story should be told within a period of 15 min. There should be a change of frame every 9 sec. Twenty minutes is the upper limit of length for most filmstrips. Each frame should present a simple, easily grasped image. The viusal emphasis should be on what is discussed on the narration. Details demand close-ups.

The slide film is primarily a visual medium. It is also a medium, like music and motion pictures, with a time dimension. It must advance in time visually. Unless this is understood at the outset and visual continuity is built in from the beginning, the slide film will be crippled.

——by GORDON R. RAY

PLANNING

The stages in planning a filmstrip usually are the following. The writer or story man begins with a research outline. This is shaped into a draft called a treatment. The treatment is polished into the final shooting script, which is a blueprint for production, photography, artwork and sound.

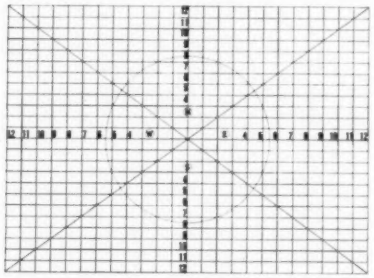
Though not always used, a storyboard can be of immense help in organizing a slide film. With the help of the storyboard's rough sketches, scenes and sequences that work together can be planned more easily and effectively.

A production breakdown made from the shooting script and the storyboard permits making photographs and art on an assembly line basis. For example, a set may be used at the beginning and at the end of a slide film. It is obviously senseless not to shoot the beginning and the end of such a film at the same time. Other possibilities of economy and efficiency are by no means so obvious; sometimes, in fact, finding them calls for real ingenuity. It is the purpose of the production breakdown to find these shortcuts before and not after work begins. Failing to find them can be a heartbreaking mistake, especially if scenes have been struck and models released.

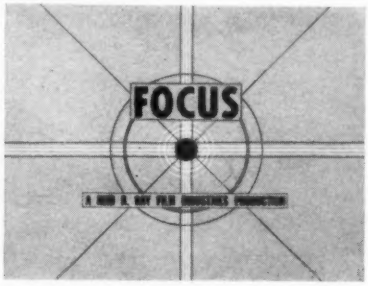
Although photographs and drawings may be combined in one film, there is danger of breaking continuity in combining them in a sequence. There is no substitute for photographic realism, nor for the flexibility of artwork in emphasizing the significant while eliminating the extraneous. Which to choose depends upon the subject of the frame, the outlook and purposes of the project and the relationship of each frame to its sequence and the sequence to the slidefilm. Each frame-to-frame change must take into consideration the fact that the eye must adjust to the new composition. The smoothness of the slide film depends upon how fast the viewer can accommodate the change.

There are problems in selecting and arranging color in a single frame. These problems multiply astronomically when as many as 100 frames must be related to each other. It would be nice, but impossible, to hire a color consultant for each commercial or industrial slide film. It is possible however for those working on the slide film to exercise taste and judgment in the process. Some rules are these: Color should not be forced into a picture simply because color film is being used. Color should complement the story and not compete with it. Technically speaking, it is up to the photographer to foresee as best as he can the color changes in reproduction and plan for them. Lighting offers a means of color contrast control. High contrast lighting is not necessary for brilliant color results.

Color test chart designed by author's firm, displays patches of colors; is quality control measure to check color reproduction of each finished slide film.



Control measure is this layout grid which proportions slide film copy of any size. Author stresses use of single size, however.



Focus frame helps set a standard for most difficult variable to control—the actual presentation of the finished slide film on a variety of equipment.

Photographic frames are made by author, shown here in silhouette, on 4 x 5 view camera, color reversal film. Final cropping is set at exposure.

STANDARDS

An important part of planning is the use of standards. For example, we do all artwork to fit within a certain size. Furthermore all artwork is punched with three registration holes that fit pins in the copy board. Likewise, all photography is done on 4 x 5 sheet film, composed so that the scene will fit within a ground glass mask proportional to the final slide film frame. The finished transparencies, their masks and overlays are punched with two registry holes corresponding to two pins on the copy board of the copy camera.

On occasion, we have used Ektacolor prints as original frames for slide films. These are projected and punched so they fit precisely with the equipment for copying artwork.

In actual practice it is nearly impossible to standardize all the variables that come into play. However, procedures are standardized as much as possible. The latitude and characteristics of the film used are carefully tested, and naturally a sufficient quantity of a single emulsion batch is ordered. The lighting is carefully controlled and every effort is made to obtain precise exposure throughout the process. Colors and materials are chosen which perform satisfactorily in tests. A careful record is made of procedures. Wherever possible, variables in size, materials and practice are eliminated.

PHOTOGRAPHY

Our standard equipment in photographing original scenes is a 4 x 5 view camera, using 4 x 5 Ektachrome. For the

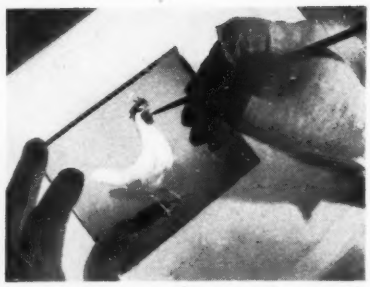
most part inside pictures are made with tungsten studio lights and Type B film. Daylight film is used where appropriate. We make an average of two and one half times as many transparencies as will appear in the final slide film. On occasion this surplus represents bracketing exposures when the photographer's judgment indicates that the meter reading may be spurious. For the most part, however, the extra shots are made with a slightly different angle or a slightly different set-up. This variety provides flexibility when the finished transparencies are edited to the final script.

All scenes are composed on the ground glass as they will appear on final form. A 4 9/16 x 3 5/16 black mask affixed to the ground glass is the guide to the photographer. It is proportional to the projected frame.

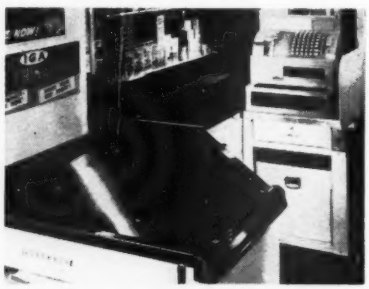
ARTWORK

Usually the photography is finished before the artwork is begun. By studying the transparencies the artist can select attention-gaining and identifying colors that will make it possible to create artwork which will establish a bridge between the art frames, studio photographs and location scenes.

A variety of art materials and techniques may be used, but it is important from the artistic point of view that the style remain consistent throughout the slide film. From the production standpoint, the art should be exactly the same size throughout. The picture size we use is 7½ x 9½. The card size is 10 x 12 (all work is horizontally composed). The border or bleed is provided to permit using an identical frame size throughout the finished strip, surrounded by a black frame. The bleed provides a leeway that prevents cropping out important parts of the composition or leaving a blank area. A worker in this field must bear in mind that slide film projectors in use are not necessarily standard and may not project the frame up to the edges. Color correction and art work on the transparencies themselves are part of the job in many slide films. The transparency retoucher tries to confine himself to the use of transparent inks and dyes. This work is exacting when dealing with the relatively small size of 4 x 5 transparencies. Most corrections can be handled with transparent media, but in some cases opaque color may also be used when dealing with large areas. Working with an airbrush, it is possible to add color to the front of the transparency as an overlay. When that particular transparency is set up for copying, it is illuminated from the front as well as from the rear, with carefully balanced transmitted and reflected light.



Most color retouching is done with transparent inks and dyes on the transparency itself, cotton gloves indicate extent of pains taken.



For retouching of large areas, airbrush may be used on overlays. Set of pictures *(above)* show before and after. In copying, lighting on the front and back of the transparency is carefully balanced.

Work on the art frames—all of which are done on same size punched cards—begins after artist examines color and design of photos.

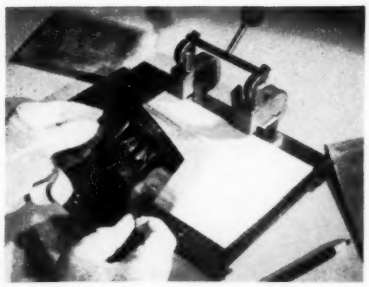
PROCESSING

The original 4 x 5 transparencies are processed outside our studio by a commercial color laboratory. The processing of transparency film is now routine. However when it comes to controlling the color and contrast of duplicates, care and judgment must be exercised in the preparation of masking. A mask is an auxiliary image used in register with an original color picture to modify the transmittance of the original.

MASKING

We make our contrast reduction masks on Kodak Pan Masking Film, exposed through a No. 33 or red A filter. We place the transparency and unexposed pan masking film in a contact frame with two .003 diffusion sheets between the films. We use an enlarger as a light source. In our set up the exposure times run 5 to 17 sec. The exposed masking film is processed in DK-50 diluted 1:4 for 2 ¾ min. The resulting mask has a density range of approximately ¼ the original transparency's—minus a corresponding density in the areas of fine detail and the blues and greens. Too heavy a mask results in a flat, desaturated color duplicate. Too light a mask will not effectively hold the contrast of the original.

The unsharp mask, made unsharp by the diffusing sheets between the transparency and the masking film, increases the sharpness of the final duplicate. It cannot resolve the fine details in the originals and therefore cannot de-



First step in masking is to punch transparency with two-hole registration punch, border left around subject.

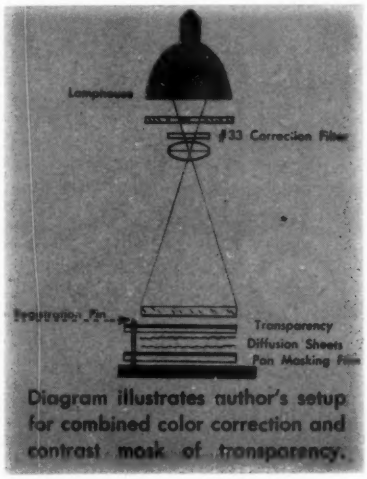


Diagram illustrates author's setup for combined color correction and contrast mask of transparency.

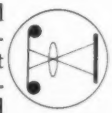
Finished single mask is shown above transparency it will control. The density range of the mask is approximately ¼ of transparency's.

crease their contrast. Subsequent reproduction does increase their contrast, however. So when duplicates are made the contrast of the fine details may be doubled.

Of course a single mask does not provide all the control possible with masking techniques. Ideally a highlight mask should be made first and registered with the transparancy before the correction mask is made. This high-contrast mask will block out the light reaching the low-contrast mask. The finished, masked transparency will then have nearly clear highlights. But this technique is usually not practical in commercial production where a great number of frames are involved, especially if the very brightest highlights are but an insignificant portion of the frame. Color reproductions without any masking at all show color errors sufficient to spoil a good color design. However, if the direction of the errors is known beforehand and taken into account, it is possible to obtain satisfactory duplicates without masks in some instances.

By punching registration holes in the masking film and the transparency before exposure and development, subsequent registration of the two images is greatly simplified and speeded up. A print frame with registration pins locks them in position during exposure and a copying frame does the same job while they are being copied in subsequent steps. By allowing sufficient border space on the ground glass during the original shooting, punching the transparencies becomes a fast and routine job.

INTERMEDIATES

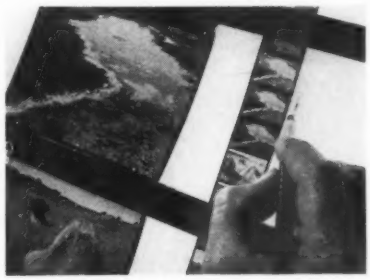


We copy the original masked 4 x 5 transparencies by reflected light from four bulbs operating at 3200K. To hold color temperature, we control voltage to the lamps with a Variac. To provide uniform illumination from behind the transparencies, we direct the lamp on a flat white reflector (a 32 x 24 illustration board) positioned 26 in. from the transparency.

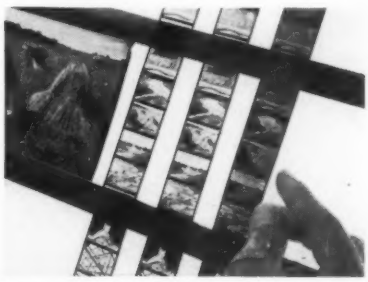
In making the original negative or master reversal positive we use a standard professional 35mm motion picture camera with a positive four-frame pull down with accurate

Assembly and editing of all transparencies that will appear in the finished slide film is necessary before reproduction begins.

Nine transparencies used by author as basic test for color, contrast and density of intermediate and release reproduction of slide film.



Extensive testing of all variables in reproduction is essential to quality. Here best of three exposures of color intermediate is chosen.



Last test is this check on three answer prints of color intermediate to select best exposure and color balance for duplicating printer.

registration of each frame behind the full-frame aperture. Second only to the lens, the most critical part of this camera's design is the intermittent movement, the device that carries the film downward and positions it a frame at a time for an exposure.

The camera magazine can accommodate up to 1000 ft. of film. Although the average slide film is about 6 1/3 ft. long, a large film capacity is necessary because it is usually desirable to make a full exposure range test of most transparencies as well as to test the balance of the art frames with the photographic frames. As much as 18 to 25 ft. of film might be used for an extensive range, color and exposure test in preparing to copy one slide film.

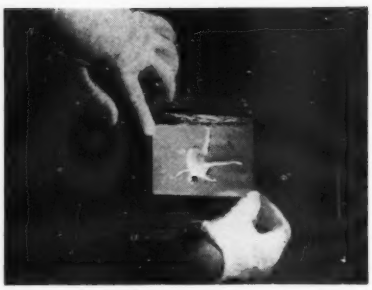
The exposure from frame to frame in a slide film is critical if one is to obtain a balanced presentation. In our unit the shutter operates at 1/5 sec. and the lighting makes possible an average aperture of f/6.3 In a run of transparencies there may be a range from f/4 to f/8. As little as 1/3 of a lens stop can be critical in copying transparencies for this purpose.

To determine exposure, we use a Norwood meter fitted with a shield 3 in. deep. The photocell is turned toward the transparency and the scale read with the slide removed. This indicated exposure is the basis for the test of the frame.

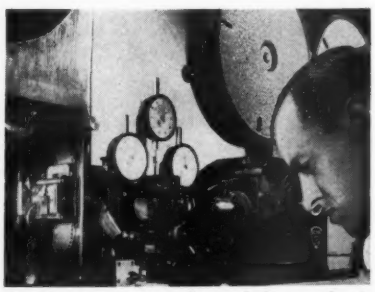
A standard set of test transparencies can be used along with a grey scale and color chart to establish acceptable exposures and consistent color balance. The set consists of a group of transparencies illustrating the variables likely to appear in any series of photographs.

Color compensating filters are necessary in some cases to improve or correct the color balance of various transparencies. When we need a slight correction we make use of the bluish and yellowish filters known as the Kodak light balancing filters. In some cases, we make use of the cyan, magenta, yellow, red, green and blue Kodak color compensating filters.

We determine the final balance of color and exposure by viewing a test strip of copies of transparencies and artwork. It may be that we make three or four exposure tests and a like number of filter



For copying, transparency and its mask are hung upside-down on registration pins in this specially made trans-illuminated copy frame.



Camera set-up, adapted by author's firm, is used to copy transparencies to 8 x 10, 35mm frames and opaque art work as well.

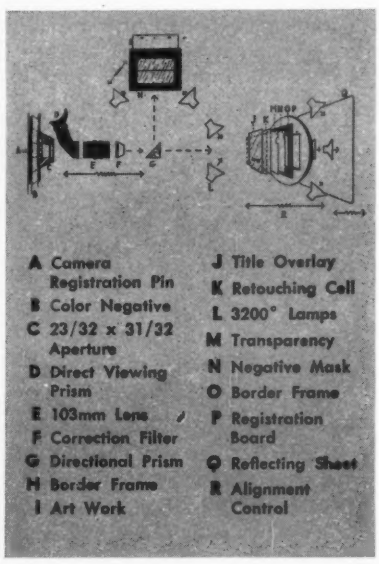


Diagram *(above)* shows schematically how the camera in photograph is set up. Reflex viewer permits accurate framing and focus of any size. Accurate registration is key to system.

corrections. A final check is made in a slide film projector. This work is a matter of judgment. Often corrections need be made only because preceding frames make them look "wrong" by comparison. The eye may be "attuned" to a series of art frames; when a photographic frame follows them, it must be adjusted in exposure and color to be in balance with the preceding work. Every effort is made to obtain what the average viewer would call naturalness.

Once these color balance and exposure tests are made and analyzed, the lens stop variation and filter combinations are logged on an exposure sheet. With a variety of copy material—transparencies, art work, overlays and superimpositions—this exposure sheet is sometimes fairly complex, but very necessary.

The copying can be done in sequence by alternating between the opaque copy copyboard and the transparency holder, although this procedure is likely to be time-consuming. Our procedure, on the other hand, is to photograph all the transparencies at one time, skipping frames for the insertion of art work. We then reverse the film and expose the art frames on a second run. This is not difficult when following scene sheets made in advance. It permits setting up a working rhythm without stops and starts that consume time.

The camera we use is equipped with through-the-lens viewing that makes it much simpler to change the field size for odd-sized copy or to re-crop a frame. The camera and art and transparency holders are movable, which makes it possible to copy transparencies from 35mm to 8 x 10 and a like range of artwork sizes.

We use Ansco Color Type 845 with a rated speed of 25 for this copying. Our attempt is to make this intermediate to compensate for the color shifts and increased contrast in the final release print. Of course this effort begins with the original planning.

RELEASE PRINT

The test of our success is the release print, which is made by a commercial color laboratory capable of making quantity prints in film lengths of 1000 ft.

or less. The control in making duplicate prints is left in the hands of the laboratory, but certain checks are made by us. Although it is not commercially, or even theoretically, possible to get absolute accuracy in color reproduction, fair standards can be formed and met. Here again the standard set of nine transparencies along with the grey scale help us check on processing quality.

When we are satisfied with this test, we view answer prints made from the intermediate print we produce. A choice is made of printer color balance to obtain the best reproduction. This balance, usually seen in three answer prints, is governed by the subject matter within the film itself. To get the best results, taste and experience with the medium are necessary—plus a good notion of the principles of color perception.

RECORDING

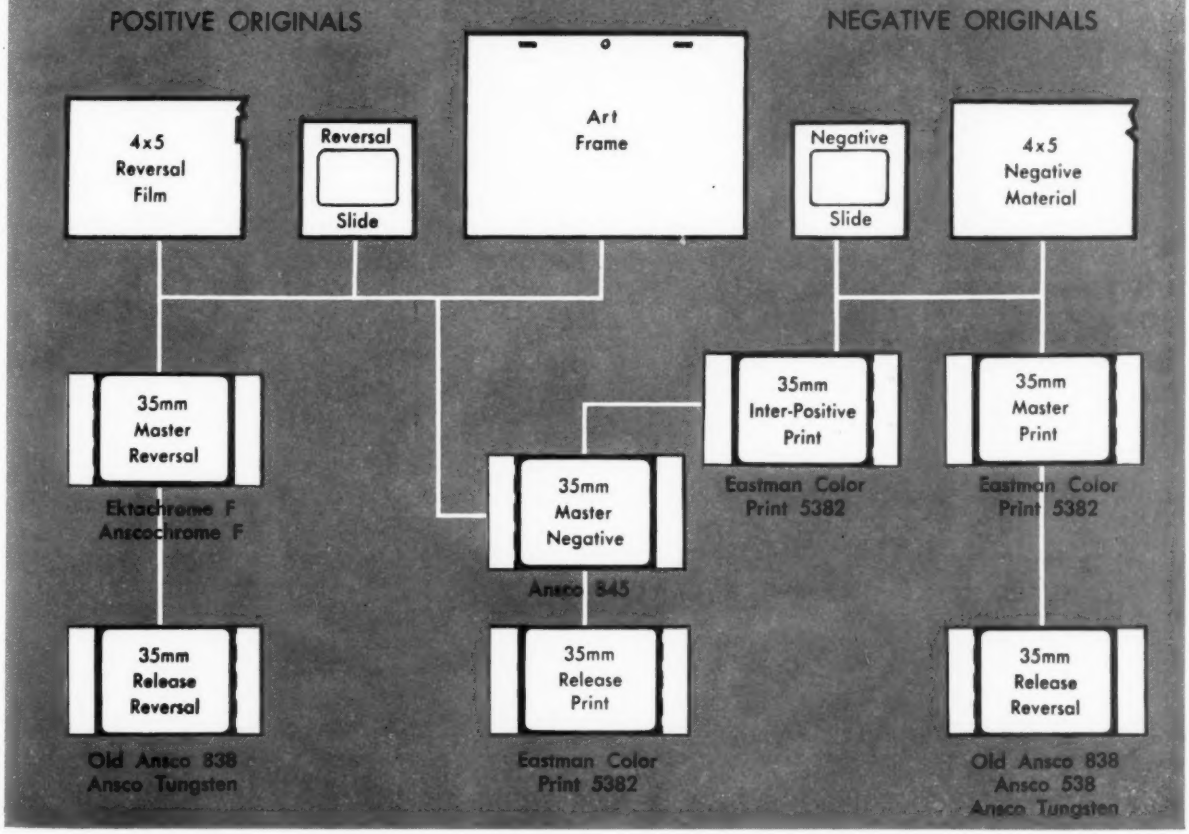
Sound effects, music and narration are usually recorded after the visual material is made and edited, but before reproduction. Recording today is done on magnetic tape with the addition of an inaudible signal in the sound tape or the final record.

PRESENTATION

The viewing conditions and the characteristics of the projection have much to do with the quality of any slide film. The most favorable condition for viewing color film is in a completely darkened room, no matter how bright the screen image can be made. Without reference points provided by competing room illumination, the eye and the mind can adapt to the reproduction losses inherent in color film, and to the overall color balance of the film.

The making of a film in color requires the dovetailing of innumerable skills. Although the most that can be expected is an illusion of reality, color techniques are constantly changing and there are few who cannot learn more by looking and studying. If no stage of production or control is neglected, quality in slide films can be very high today. Tomorrow we can expect even finer quality.—THE END

MANY AVENUES OF SLIDE FILM DUPLICATION are demonstrated in this flow chart which begins with any one (or combination of all) of five different kinds of originals and ends with any one of three kinds of mass-produced third-generation duplicates. Artwork goes through only two generations of duplication and is designed with reproduction in mind. Therefore it does not require masking control operations described earlier.



PORTFOLIO NO. 17

General Dynamics, with both feet planted firmly in the 25th Century, publishes a spectacular annual report to transmit its jet-propelled corporate image. Reception: loud and clear.

The world of General Dynamics is a restless world, built upon the esoteric technology of jets, missiles, electrons and atoms. Although some of the operating divisions date back to the pioneering days of the airplane and the submarine, practically all of Dynamics' present activities were science-fiction twenty years ago and crude experiments ten years ago. The excitement in this newest of frontiers is reflected in its annual report, a spectacular example of current corporate literature.

Conceived in "the corporate image," a Madison Avenue phrase meaning "what do the civilians think of us," the report is a visually exciting combination of imaginative design, lavish production and photographs of more than ordinary merit.

These pictures, both color and black-and-white, are largely a product of General Dynamics' photographers working in the photo sections of the operating divisions. Their high velocity impact is a tribute not only to the photogenic quality of Dynamics' operations but to the photographers themselves. Here are the shapes of the future, vaguely uncomfortable, surging with power as they strain at the limits imposed by the mind of

so puny a creature as man.

Work on the annual report starts with a memo from John Niven, Director of Publications, to Vernon Welsh, Vice President—Communications, reviewing major events in the preceding year of company operations. From this is evolved the theme, a basic hook on which the report is hung. In 1958, the theme had two parts, "customer use and acceptance of the corporation's products" and "new non-defense commercial products stemming out of research and development."

A directive explaining the theme is sent to division public relations sections and the work of collecting data and photographs which fit into the theme begins. It was necessary, in order to find photographs of the required quality, for John Niven and either Erik Nitsche, art director who designed the book, or Len Siennick, in charge of production, to visit several plants.

The problem was finding photographs to fit the theme, with good technical quality and, most difficult, that indefinable "oomph" which makes for great photographs and great movie stars. A final screening was made by Erik Nitsche from approximately 500 photographs. While the selection was Nitsche's, final responsibility for each of the pictures used rested with Welsh.

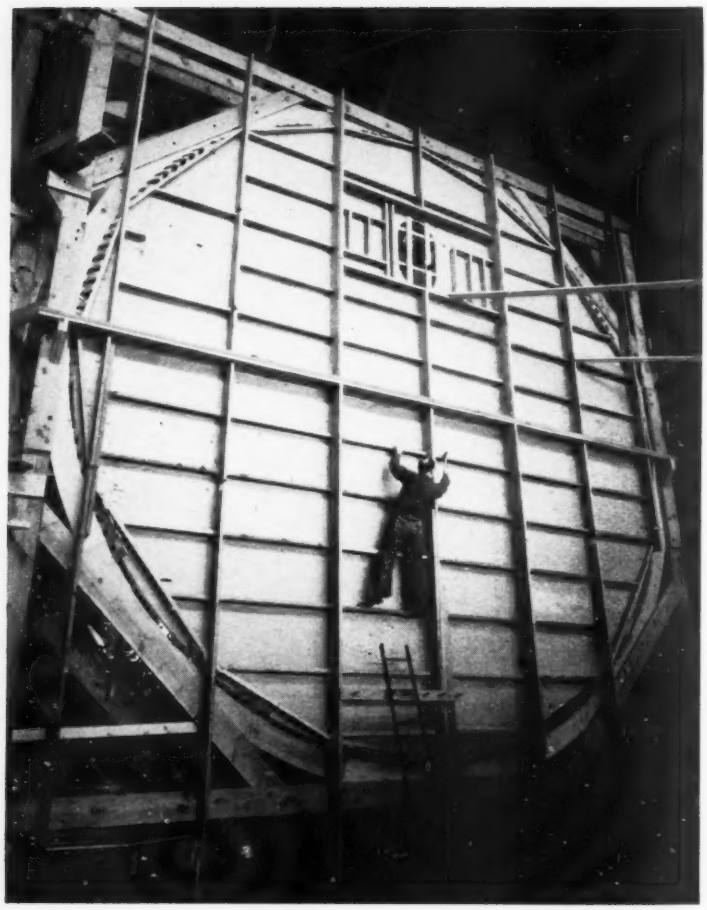
Some of the photographs came from outside sources. The picture of the USS Skate at the Pol was made by a Navy photographer. But the number of outside pictures was kept low, partly to minimize production costs which were less for the 120-page 1958 Report per copy than they were for 1957's 68½-page book. Generally, however, the most effective picture regardless of source was the one used. The final selection is a credit to the competence and imagination of General Dynamic's far-flung in-plant photographers.

Ron Church, Convair, uses a Speed Graphic, Anscochrome film, and a T-33 plane to photograph B-58 at 21,000 ft. *(preceding page).* Camera was modified for aerial use with aluminum cone and neoprene rubber ring around lens, allowing camera to be pressed against canopy to eliminate reflections from glass.

Henry Kierstead, Convair, used available light for shot of Atlas missile assembly. Problem was to make interesting picture without breaking security ban on missile photos. Using a Speed Graphic, exposure was 1/10 sec. at f/8 on Royal-X Pan. It was developed in UFG for 10 min. Convair distributed 2,400 prints of his picture.

Automatic camera, installed by RCA, made this picture of an Atlas launching. Camera, a K-25 aerial job, was one of several cameras operated by remote control from a blockhouse at the launching site. This is a good example of an excellent photograph taken by accident, taking a photograph every three seconds for data.

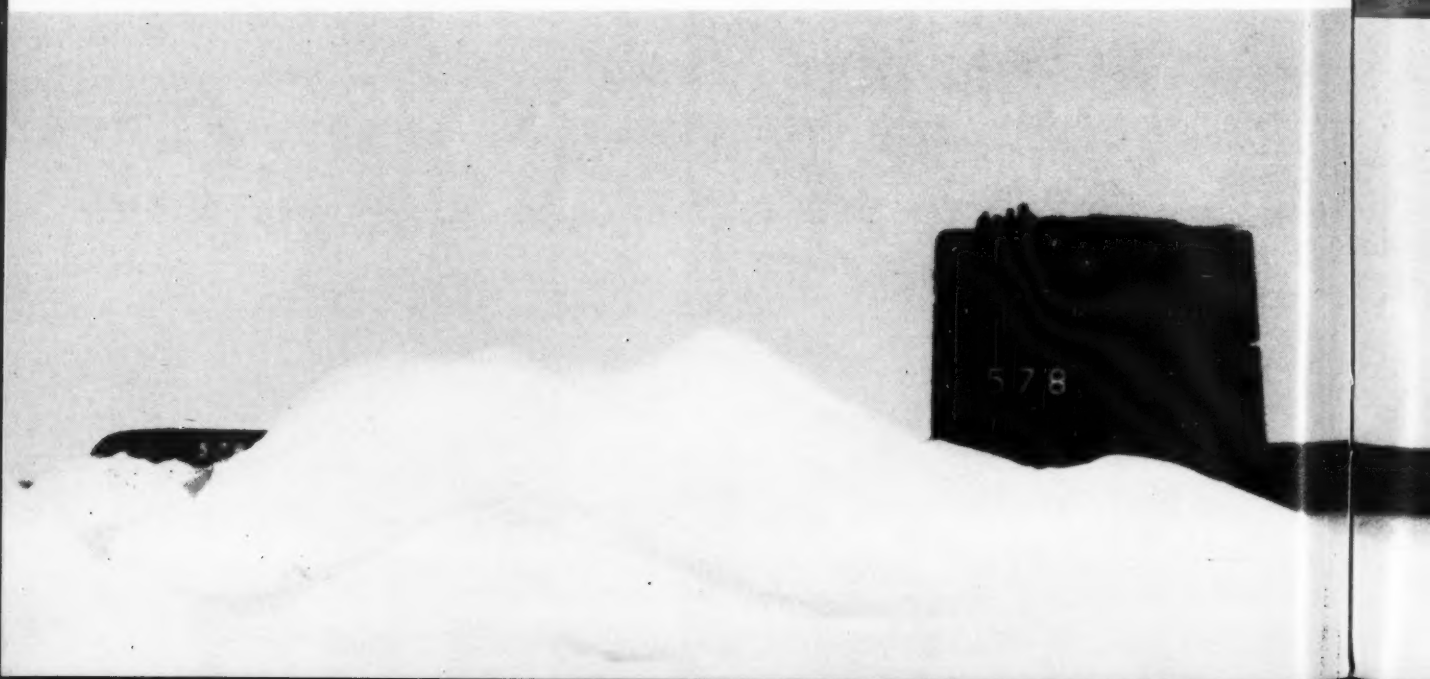
James Combs, Jr., a writer-photographer for *Convairiety,* the Convair house organ, made this photograph of a ground-mounted Terrier missile at the Naval Ordnance Test Station, China Lake, Cal. He used a Rolleiflex, no filter, and an exposure of 1/250 sec. at f/16. This unit is similar to those on missile ships.

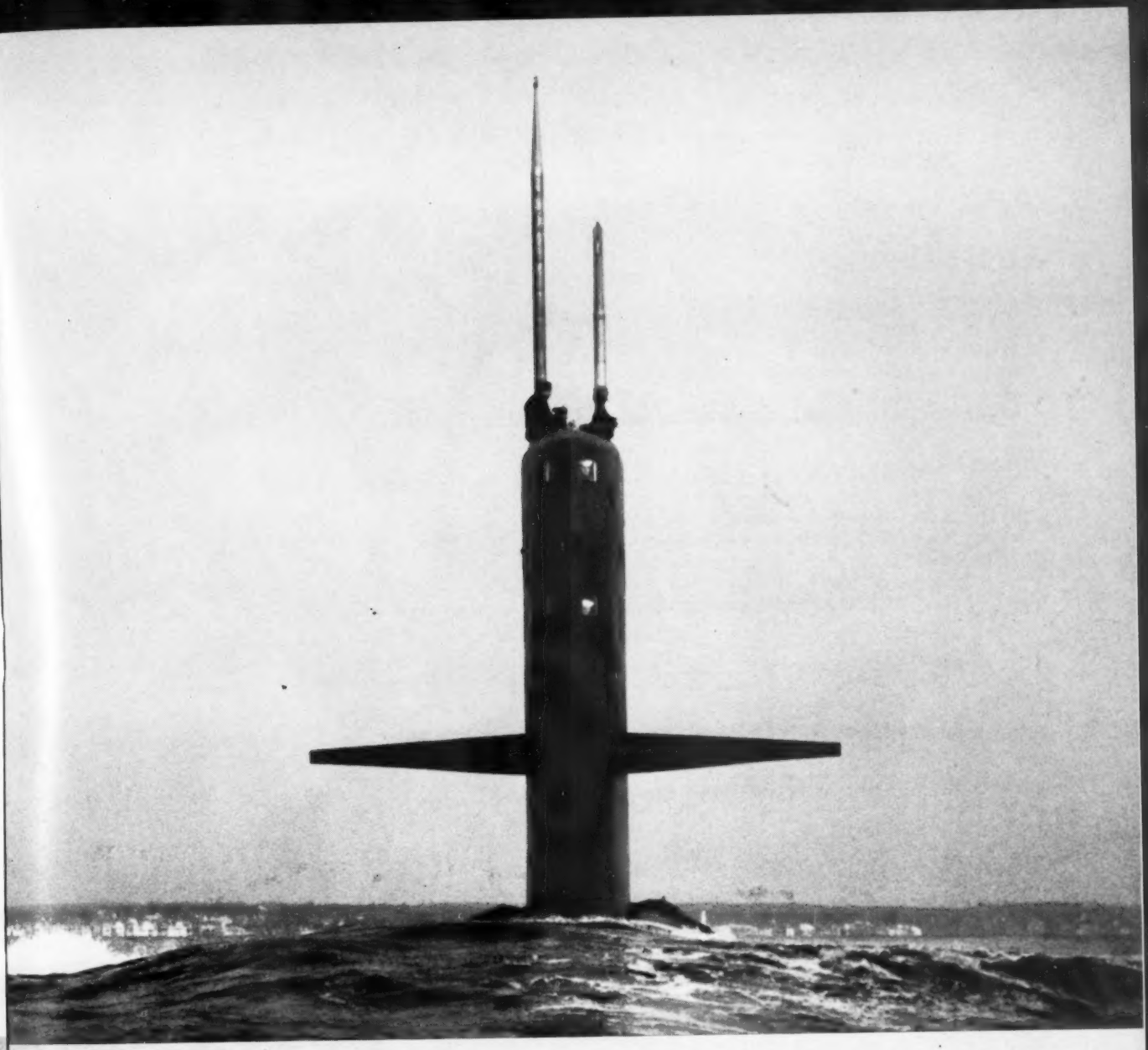


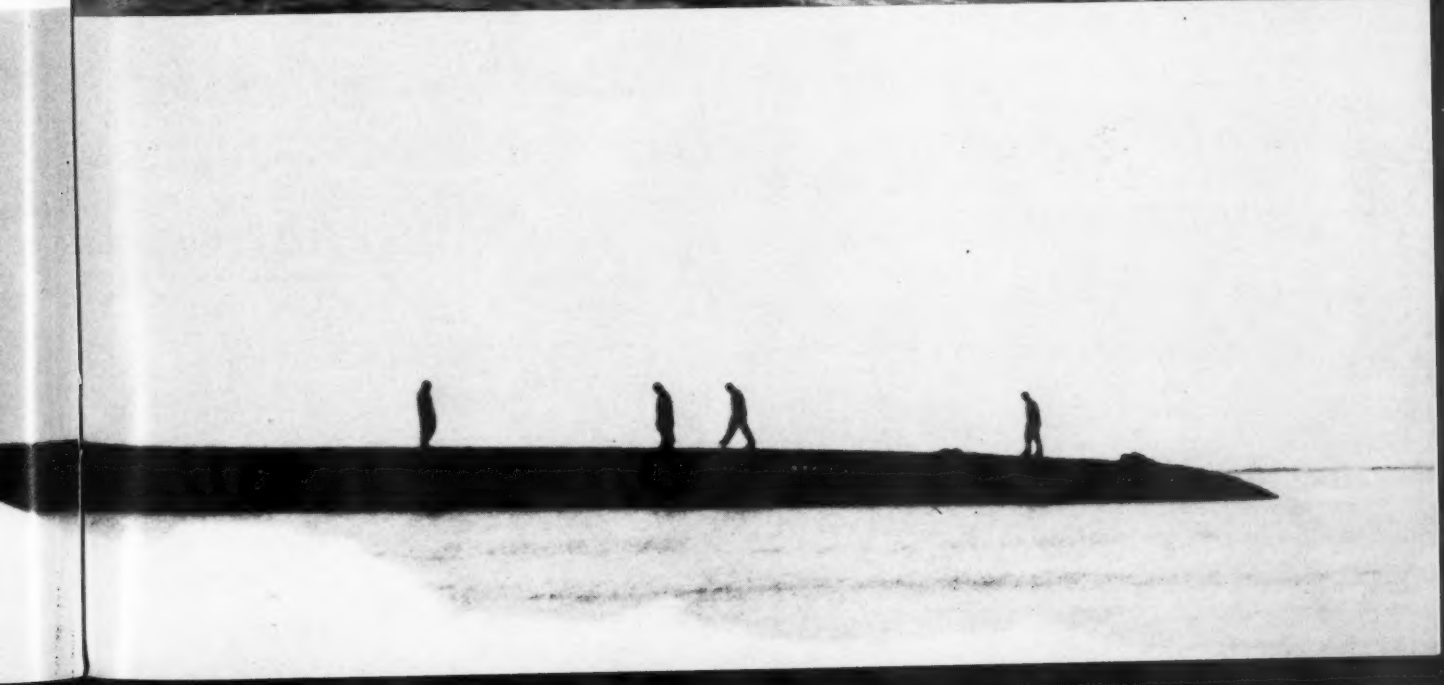
Philip K. Dewire, Electric Boat, used a 4 x 5 Crown Gaphic to get this shot of a mock-up of the cross-section of a submarine. His exposure, using Anscochrome, was 8 sec. at f/22. Light was augmented by two No. 2 photofloods. A 90mm Schneider Angulon f/6.8 wide-angle lens was used. Electric Boat is one of the oldest of Dynamics' seven divisions.

USS Skipjack, one of the newest and fastest nuclear subs, was photographed by Philip Dewire for Electric Boat, builders of the sub. The picture was taken from a fast cabin cruiser about 100 yards from the boat with a Crown Graphic and an Optar f/4.7 lens. The exposure, on Tri-X, was 1/400 at f/8. The conning tower is now called a sail.

USS Skate in Polar ice was one of the few pictures in the 1958 Annual Report not made by General Dynamics' photo staff. This picture was made by a Navy photographer. This submarine was built by Electric Boat, the oldest submarine builder in the country. Its name derives from the use of storage batteries to power the sub when submerged.



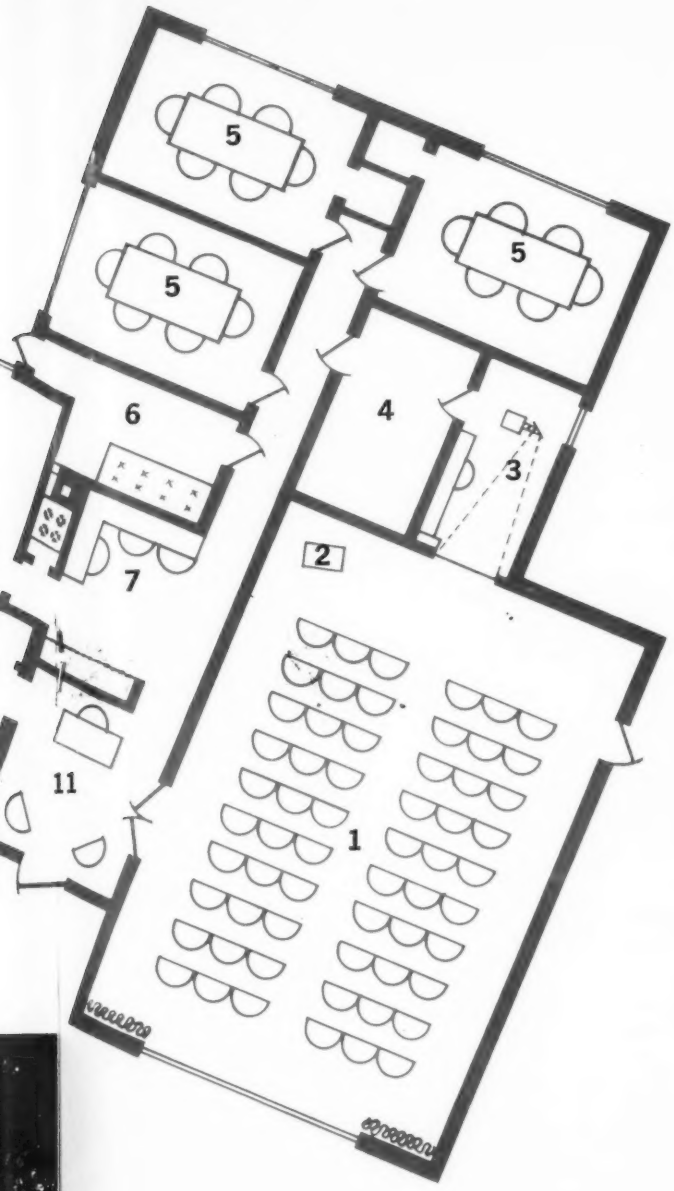




CIBA

To meet the rough competition of today's drug market, CIBA Pharmaceutical prescribes concentrated doses of training to make good salesmen better. Backing the action is their new training center, loaded with audio-visual gadgetry, from blackboards painted green to a rear projection screen, coordinated and automated to teach with the greatest of ease

1 Au
trols
roon
4 St
6 Lo
8 Of
cleri
10 A
and



CIBA TRAINING CENTER

1 Auditorium 2 Speaker's lectern with controls for projection equipment 3 Projection room with projection, sound equipment 4 Storage room 5 Small conference room 6 Lounge 7 Buffet for snacks, coffee breaks 8 Offices for training staff with desks for clerical staff 9 Training director's office 10 Assistant training director 11 Lobby and receptionist

A good salesman (or detailman in drug talk) is made, not born, according to the gospel at CIBA Pharmaceutical Products. Supporting their contention is a new training center at Summit, New Jersey, equipped with one of the most complete audio-visual installations on the current training scene.

Sales training, an important factor in the success of any company, is particularly important in the drug field, due partly to the highly competitive market and partly to the unique role of the detailman. He can be defined as a salesman who never writes an order. Instead, he visits potential customers giving them details (hence the name) on new products, many of which are available only on a prescription basis. The impression he makes must be strong enough and favorable enough to last until the next prescription is written. In a sense, he serves not only as sales representative, but as adviser too, comparable perhaps to the "registered representative" in the securities field.

Sales training, therefore, must cover two major areas, product knowledge and sales techniques. In addition, CIBA gives instruction on chemistry and physiology. What must be taught, and to whom, determines what tool the training staff will select from their well-stocked A-V workshop whether it be a filmstrip, a display or a recorded case history.

The training pattern at CIBA has three phases. First, there is the two-week basic indoctrination for new men, conducted by the training staff in the field using portable or rented equipment. Phase two, at the training center, is for sharpening the techniques and eliminating weaknesses of men with six to nine months service. Finally, there is a one-week refresher at the center after three years to keep detailmen informed of new products and company developments.

Underlying the training program is the concept that two senses are better than either one alone and that participation is more effective than passive learning. Since training time is relatively non-productive, it must be used as effectively as possible, to benefit both the man and the firm.

One of the needs filled by the training center is flexibility, the ability to chose from several methods, from chalk talks to overhead projection, to convey the information as effectively as possible. If one method is not successful, another method may be tried which can be absorbed more easily by the particular group in the training program.

Work began on the center in November, 1958 and the official dedication was in July, 1959, although the first training sessions "jumped the gun," classes being held in May. Before the training center, sales training had been conducted in various hotels throughout the country, depending

upon where most of the participants were from. While these makeshift arrangements were satisfactory, they were limited and not as conducive to learning as at the center, designed for use not only by the sales training staff but by other departments as well.

The building contains approximately 5,000 sq. ft. of space, including offices for the training staff, an auditorium, three conference rooms, coffee break facilities and the projection room.

Unlike many A-V installations which are accumulations of equipment in one area, the CIBA installation was conceived and assembled as a "multiplex" system, with all components coordinated for best performance and automatic, remote control operation. The control panel for the system is on the speaker's lectern, permitting him to use movies, slides, filmstrips, tape recordings and recorded discs, all without leaving his position on the stage.

Conference room, one of three, is suitable for role playing techniques using small groups.

Three of the four projectors included in the system are mounted on a custom-built table in the center of the projection booth, prefocused on the rear projection screen. All items are standard units with slight modifications to fit the special conditions at CIBA. The 16mm Victor sound projector has a 72-frequency shutter instead of a 48-frequency shutter for more even projection with less flicker. The American Optical 3¼ x 4 lantern slide projector is fitted with a Genarco slide changer, permitting pre-loading and automatic showing of up to 70 slides. The DuKane 2 x 2 projector requires no mechanical adjustment for automatic operation.

A Transpaque Jr. overhead projector is also available, but unlike the other three projectors, it is portable for use in the conference rooms. Operation is non-automatic.

All the automatic projectors use a lens of shorter-than-normal focal length to project as large an image as possible within the 13-ft. limits of the booth. The effect is similar to using a short focal length lens on an enlarger to project a bigger picture. In addition, the Victor, DuKane and Transpaque projectors use a front-surfaced reversing mirror to maintain the correct lateral relationship with rear projection. Since the audience is, in effect, looking at the back of the screen, an unreversed image from the projector would appear reversed to the viewers. The lantern slide projector does not need a mirror because the same effect is secured by reversing the slide in the changer magazine.

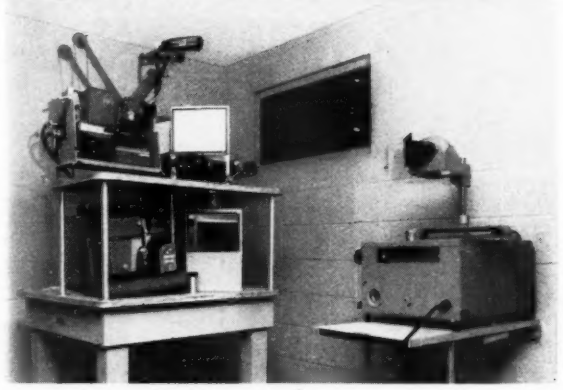
Part of the problem facing E. J. Barnes and Co., industrial A-V specialists who installed the system, was achieving uniform illumination on the screen from four different light sources. It was necessary for Jim Cushing, of Barnes' A-V division, who designed the system, to make tests with over two dozen lenses of varying speeds and focal lengths to get this uniformity. The Plexiglas rear projection screen was coated with a special coating, selected for its transmission characteristics, by Polacoat to Barnes' specification.

The audio system includes an Ampex 351 tape recorder, a 40-watt Altec amplifier, an Altec mixer amplifier and a switching panel, all mounted on a special cabinet. Next to the cabinet is the 16-in. Rek-O-Kut turntable with a Rek-O-Kut arm and GE diamond-sapphire cartridge. Ampex 601 tape recorders are in each of the conference rooms.

Holding from 50 to 100 persons, the auditorium contains 12 Altec 12-in. speakers, scattered throughout the room, giving more natural sound than two or three larger speakers at set positions. Three omnidirectional microphones are installed over the stage so that the speaker can move around, assured that his voice will be heard without loss of volume or quality.

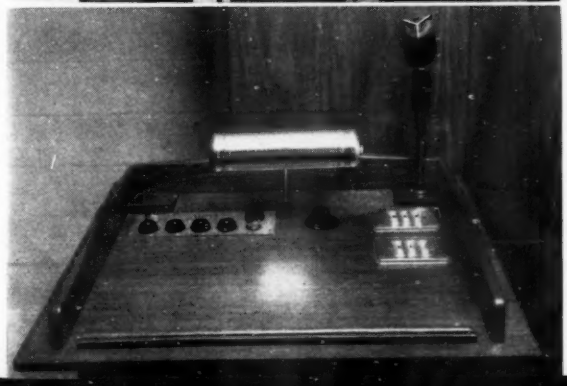
The type of equipment and materials used depends upon the presentation required. The portable overhead projector has proved very useful in teaching concepts, where it is important for the teacher to observe the reaction and progress of his class. Since it is non-automatic, presentation of materials can be more flexible. It is possible, for example, to return to a previous exhibit, whereas once a slide passes through the automatic changer, it's had it.

Slides are used as part of the medical lectures, given by CIBA's medical department to sales trainees on various functions of the body, the anatomy of the body and its systems, and some of the chemistry of healing. The training department has about 800 slides on medical subjects,



Multiplex system. Gordon Burmester of training staff edits a training film. Audio control board is in the background with tape recorder, switch panel. Three projectors on table can be operated either from projection room or speaker's control panel. Overhead projector at right can be moved to conference rooms.

Audience view of rear projection screen and lectern at left of stage. Close-up shows controls available for speaker's use. Knobs at left control sound system while buttons at right control movie, slide projectors.



made by the CIBA photo department which is part of research.

This is the only training material made by CIBA, the various films, strips and displays being made by specialized firms to meet the training department's requirements. Loop films, used in role playing, are made by companies like Seminar Films, while some of the displays come from firms like Ad Master. Scripts for the films are prepared by the training staff.

Subject matter of all training material falls into several major categories. One type, of course, is the medical information. Other material covers such aspects of the detailman's job as meeting objections, making sales presentations, using demonstration material and packing his sample case.

One of the more successful techniques at CIBA uses loop film, 16mm 4-min. sound movies adapted to role playing techniques. An imaginary sales situation is established and the trainee, under the watchful eyes of the teacher and his fellow trainees, makes a practice presentation. Two types of films are used in this situation.

One is pattern films, which show a detailman making a presentation to various types of customers, all doctors. The types include a "difficult personality" (a euphemism for the occasional nasty type), the "medical enthusiast" who can't stay on the point (much friendly talk but no sale), the "specialist" (who wants clinical reports on anything new) and one on "corelated practice."

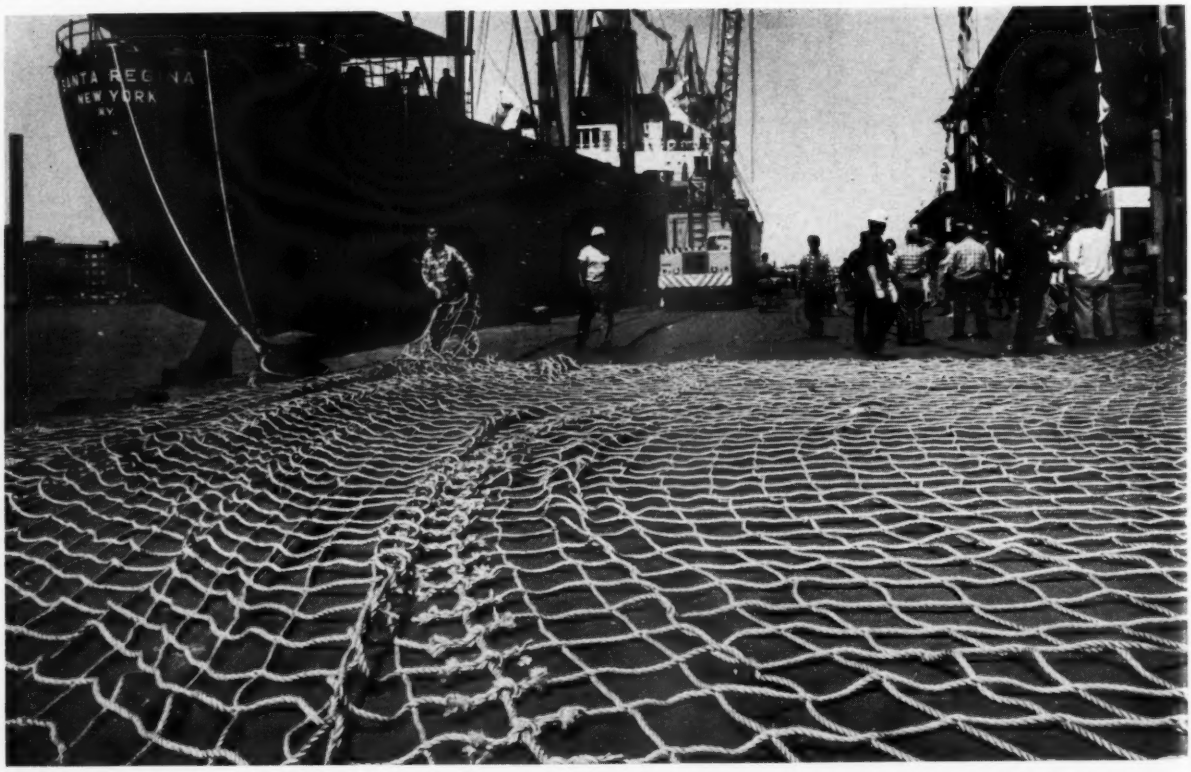
This is really a pair of films, both the same except that one shows the sales presentation while the other portrays the doctor with the salesman's dialogue omitted. First the trainees see the pattern film and hear the doctor's questions. Then, the "corelated practice" film is used; they see the doctor but there is no sales dialogue. Instead, a white line appears along the bottom of the picture. When the doctor stops talking, the line comes on and gradually gets shorter until it disappears. Then, the doctor speaks again and the white line process is repeated. The purpose of this film is to get practice in timed sales presentations, to give the important factors quickly and effectively so as not to waste either the doctor's or the detailman's time.

Often, the same subject will be presented using two different methods, say a filmstrip and the overhead projection. This is done when it is necessary to repeat information to make sure it stays learned. Seeing the same thing over again can be boring and boredom interferes with learning. By seeing the same facts in different form, it can be absorbed more easily.

Another technique involves (*continued on p.* 92)

GEORGE EMRISEK, Allegheny Ludlum Steel Corporation, made this picture for the monthly house organ with a 4 x 5 Speed Graphic using open flash with a No. 5 bulb. It shows a welder repairing a thimble-shaped slag pot.

W. E. CLARK, Illinois State Natural History Survey, shows what a 13-year-old adult Cicada looks like. He used a Hasselblad 500C with a 1-meter close-up lens. With two electronic flash units, exposure was 1/250 second.



ROBERT PACKO, Toledo, Ohio, made this picture of the first American ocean-going ship to dock at Toledo. The netting in the foreground prevents cargo from falling into the water, being hung from the ship to the dock. The photo was for Burr Agency, a Public Relations firm. Packo used a Hasselblad Superwide camera and Ilford FP3, 1/60 at f/22.

PMI's Monthly

READERS' SHOWCASE

PMI's readers supply solutions to industrial photo problems

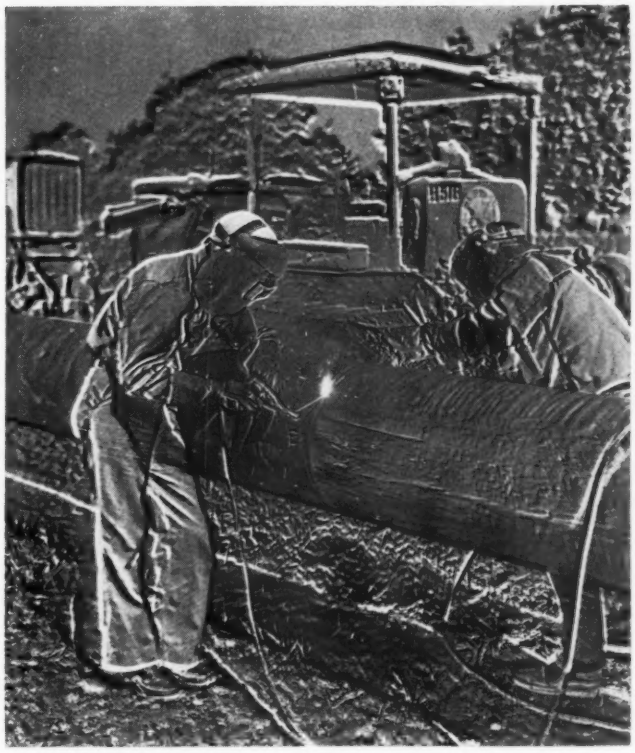
Generally, the pictures used in Showcase tend to have a unifying theme: they are all big pictures, little pictures, dark pictures, light pictures . . . etc. Part of the reason is that most photographic problems faced by industrial photographers are, basically, pretty much the same.

There are pictures of company operations, of plant construction and equipment, of new installations, of the people who make up the company. But while the problems are similar, the approaches used by photographers vary to an almost unbelievable degree, reflecting just about every degree of skill from hack to genius.

This month, the pictures don't have a theme, being selected as better-than-average samples of the month's contributions to this department. Apart from having been made for public consumption, house organs, news releases, advertisements, the only thing they have in common is that they were made by photographers in industry.

You are invited to send in your pictures for this feature. Here are the details.

There are two rewards for each of the pictures chosen. The first is knowing that your picture will be seen by appreciative fellow professionals. The second is $10. Please include your name and your company's name, a note about the picture and how it was used, with the technical data—paste the information on the back of each picture. Send pictures to SHOWCASE, PMI, 33 W. 60 St., N. Y. 23, N. Y.



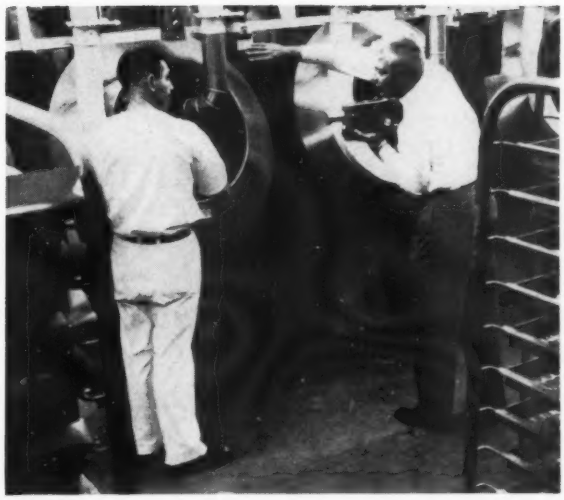
JOSEPH A. BANIK, New York State Natural Gas Corp., Pittsburgh, Pa., transforms a routine shot of a welder into an interesting bas-relief superimposing a negative and positive out of register. The original was a Crown Graphic shot on Verichrome.

JIM ROBBINS, Graflex, Rochester, N. Y., used a 4 x 5 Super Graphic, making this picture for advertising purposes. A little vaseline rubbed on the hands picked up highlights. Exposure was 1/25 at f/32, using front swings and tilts, on Panatomic-X.

LILLY NEWSREEL

Working with light tackle, two Eli Lilly staff men annually land a big story: a film capsule of the lives and labors of 9000 employees throughout the year. By sandwiching the motion picture work in with other employee communication efforts, they are able to be there when things happen, get a sound-and-sight real-life record of what Lilly has done for people lately. Capper is a TV presentation of the film for Indianapolis neighbors. Cost of the 15-20-min. professionally-done opus is kept under a budget of $3000

Location sound sequences are handled sound-on-film with the Auricon, may be one or two-man operation. Quilted mattress pads hung about room serve to deaden echoes.



Shooting on the wing, Bill Herman is director, cameraman, electrician, grip and tripod. Camera is loaded with Tri-X. Fluorescents in plant provide illumination necessary.

Amazing what a little phrase like "it might be a good idea" can lead to. Take the Lilly Newsreel. This annual progress report on film started in 1952 when that famous thinker, Anon, decided it might be a good idea to show a movie of a new plant under construction to an Eli Lilly annual management dinner.

The idea was, as they say, concretized three days before the meeting. Some hectic and hasty labor was needed. Since there were no photographers at Lilly in those days, the assignment fell upon two writers who, in the best Orson Welles tradition filmed, edited and recorded the entire film. Needless to say, the production was successful.

In 1953, Jim Root, a still photographer, was added to the payroll. Included in his inheritance were the usual bent paper clips and broken rubber bands, a Cine-Kodak Special, a titling set, some miscellaneous footage and an assignment to do a newsreel. With the help of one of the 1952 writers, he brought in "1953 In Review," the first in the newsreel series.

Lilly likes to communicate

The Lilly Newsreel rounds out a well-organized communications program designed to keep the 9,000 employees informed and entertained. In addition to the Newsreel, there is a bi-weekly newspaper, a bi-monthly magazine and newscasts on the PA system. Some of the subjects shown in recent Newsreels included information on the company stock purchase plan, news about polio vaccine production, a fire at one of the plants and an introduction to newly appointed officers.

The film is presented to complete a year-end program that includes an address by the president of Eli Lilly on the state of corporate affairs and a projection of future growth.

In format, the motion picture is strictly news. "Inspirational" scenes and talk are eschewed. In their stead is a documentary report that would delight Sgt. Friday's ears.

Every year saw an improved edition with better photography, editing, writing and technical quality. The increased use of lab services helped change the newsreel from an amateur movie to a professional-type production. In addition to the services, the lab supplied invaluable advice.

Bill Herman, a former freelance newsreel cameraman, was added to the project staff and helped put together the last two (1957 and 1958) films. The 1959 film is being done by Jim Root and writer Don Prescott. Lilly tries to alternate photographers and writers on this assignment, since it has to be fitted in with other work handled by the photo department.

They shoot, then script

Unlike most films which start from a script, the Lilly Newsreel starts with the silent footage, edited to give a fast pace to the picture. The script is

then written to fit the time set by the footage.

Narration is supplied by an announcer, selected from a variety of taped voices offered by the Calvin Co., Kansas City, Mo., who handled the lab services last year. Formerly, a radio announcer was used but when Lilly began to record in places away from Indianapolis, it got too complicated and expensive to use him.

f/11 and be there

There is no set schedule for the newsreel but virtually all company events—open houses, plant dedications, etc.—are shot as they happen. A list is prepared by the writer and photographer to determine the subjects to be covered. Sometimes, when things are slow, the photo department will try to pick up some footage for sections needed in the newsreel. The last month of shooting is October. Since many sections require fairly late shooting, this becomes a pretty hectic month.

They try to get all available footage out for work prints and edge numbering early in October. This includes coverage on events which can be edited upon return from the lab. Editing begins, ideally, about the middle of November and takes about a week to go through some 4,000 ft. and get it into useable length.

The writer gets the edited footage and writes a script to fit. While the film can be lengthened or shortened to fit the script, the visual effect is the most important consideration. The edited work print is shown to the heads of the various company operations for information and any suggestions they might have on the way their operation is shown. There are very few objections to the footage, although occasionally, a word in the script might be changed.

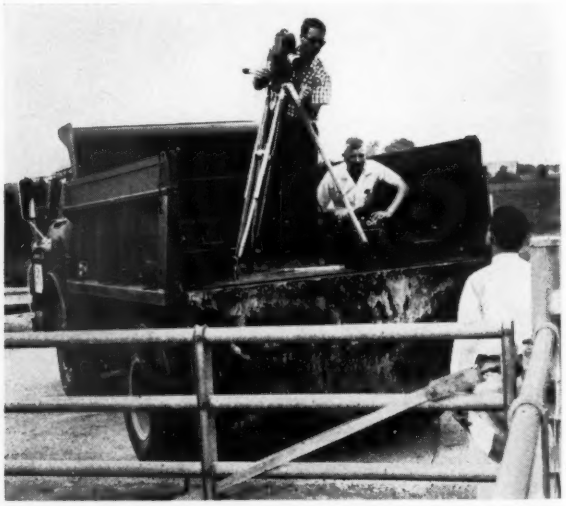
Subject matter of the newsreel is divided into "news" and "feature." The former are events which are shot as they occur, such as ceremonies, fires, important visitors, etc. These events will make 1 to 4-min. sections of the newsreel.

Feature material is planned by the writer and photographer and includes such subjects as benefits, research projects, new products, sales promotions, etc. Some features are completely planned while others may be put together in the editing.

Edit by feel

There are no rules as far as editing goes. If a scene "feels" right, if the pace is not too awkward or the continuity too forced, that is the way it will be done. Some of the factors which are taken into consideration during the editing include good opening and closing shots, variety of camera movement and scene length, variety of camera angles, direction of action and proper use of fades, dissolves and cuts. All work is done on a work print. Scenes may run from 1 to 20 sec. but they tend to be on the short side, averaging about 4 seconds.

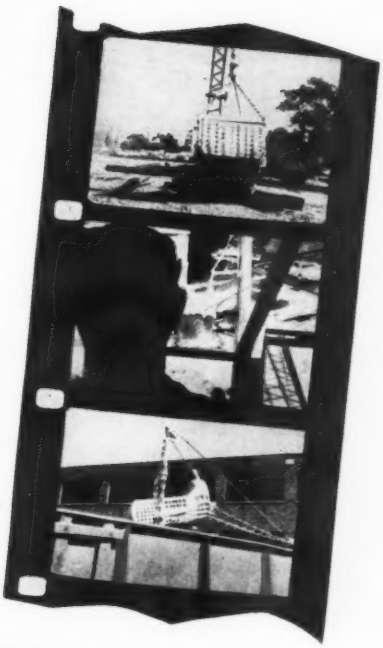
Whenever there is time, orthodox procedures including careful tape measurements are carried out. Zoom lens substitutes for much equipment. Card fills in window light.



Four-ton dolly is company truck. Of angles, Root (at Auricon) and Herman (riding gain) say: use 'em but don't subject audience to a roller coaster ride.

Newsreel covers touchy subject and the thrills of a sidewalk superintendent with smooth equanimity

Unused bottles, empty shelves and vacant laboratories *(above)* flash briefly on the screen during the 1958 newsreel as the voice over film explains that curtailed demand for polio vaccine forced a cut-back in its production at Lilly, cancelling out a number of jobs. Busy typewriter begins the rest of the take: no employee lost his work; all were employed by other departments with no cut in salary; some were retrained for higher-paying jobs. A neat trick introduces a sequence on plant expansion *(left)*. Camera is positioned at table level. Blueprint of a new building comes rolling out at audience. *(Above)*, audience gets vicarious satisfaction of a desire close to the heart of every sidewalk superintendent: camera switches from dragline to operator's cab, then back for construction shots.



The Lilly Newsreel takes a strictly documentary approach, using natural light wherever possible and avoiding the use of actors and props. With the good lighting in modern plants and with fast films, almost any type of movie may be made by this method. Where lights have to be used, to maintain the quality of the picture for example, they are used so as to augment natural lighting rather than to create new lighting. Plus-X is used for outdoor and well-lighted scenes while Tri-X is used for available light work. Sound recording is on a single system and on single perforation stock for easier editing.

Finishing, TV and costs

After the script and film have been approved, the recording of music, narration and sound effects is done at the lab in Kansas City. After titles are added, an "interlock" is used. This is the complete sound track run in sync with the work print. The writer and photographer have to approve this before the lab takes on the task of turning out the exhibition print, with sound and picture in perfect sync. This lab work takes about three days.

In 1958, the Lilly Newsreel went on television as a 15 min. show. The plan for the 1959 newsreel is to show as much film as is necessary to cover the story. Then as much TV time will be purchased as is necessary to accommodate the film—perhaps 20 to 30 min. The slot purchased for the 1958 effort was class A time: Monday, 8:30 p.m. Locally the rate is approximately $500 per 15 min., not assigned to the costs of the newsreel. Through TV the message reaches many more employees than otherwise, and affords non-employees in the Indianapolis area a glimpse into the life of their Lilly neighbors.

The total budget for the 1958 Newsreel was $2550. This breaks down into $540 for processing 6000 ft., $310 for a 3000-ft. workprint, $1500 for titles, music, sound mix, conforming and final print, and $200 for travel expenses to the lab.—THE END

SUGGESTIONS MAKE MOVIES

Utilizing a minimum of equipment and simple home movie techniques, Fred Denz, Suggestion System Director, produces 30-minute films starring successful employee suggestions at Remington Rand plants

As director of the employee suggestion system at Remington Rand Fred Denz's job is to promote the idea of a suggestion system in 29 widely scattered company plants throughout the United States and Canada. Between pep talks, general planning and administration, Denz has managed during the past two years to make five 30-minute movies—two in black-and-white and three in color with magnetic sound —to make clear to supervisors how they, the company and their employees benefit from the suggestion system. By training himself to do nearly all the work on the films he has kept costs down to $500 per film, and has in some cases sliced that cost to $250. He has surprised everyone, including himself, with the quality of the films. With two years of industrial films under his belt, Denz brags that he does not to this day know what an f-stop is. It's obvious looking at the films, however, that Denz knows very well how to use f-stops, meters and filters to good advantage.

The idea of making the films came to Denz while in "brainstorming sessions" he found it sometimes difficult to get across in a talk exactly what some of the employee suggestions consisted of, much less how valuable they were. At that stage all he knew about movies was how to buy a ticket for a double feature, but he felt that this was the medium for communicating his ideas.

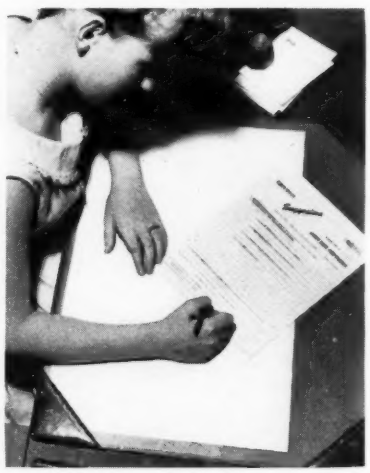
First step was a briefing by experts in Rem-Rand's A-V department. Next Denz picked minds at Kodak's Cine Sales Division. He ended up buying a Cine-Kodak K-100 with a single f/1.9 lens and a Pageant magnetic-optical sound projector. Add a Craig projector-editor, three 4-light lamp bars, a case of bulbs, a Quick-set Husky tripod and an exposure meter to complete the list. Total expenditure: less than $1500.

Denz simplifies his film technique to what he calls the backyard method employed by many amateurs. He employs no wipes, fades or dissolves. He employs straight cuts from scene to scene. His specialty is a one-two punch. Starting with a long shot which establishes the scene he moves in closer for the second and third shot which is then followed with a close-up. He eschews angle shots and keeps pans down to a minimum. This is dictated by the simple three-position lighting set-up which focuses on a limited area. Clarity of statement is Denz's forte rather than artistic bravado. He even eliminates title costs by utilizing such familiar objects as road markers, route numbers and other signs to establish the locale of the film.

Denz writes his own scripts after the footage is exposed. In his earlier films he read from a typescript as the film was shown. Most of the later films' narration is recorded magnetically directly on the film. The sound striping was done by Heglund & Holland in Buffalo and Denz recorded his script in one of their sound studios as well. The Kodak projector is capable of recording but he felt that outside noises were much more simply eliminated by utilizing professional sound studios and equipment.

(*continued on page* 89)

Fred Denz does own editing with Craig projector-editor and splicer



Suggestion idea begins road to stardom on official suggestion form

Light-weight equipment permits simple set-ups for filming suggestions

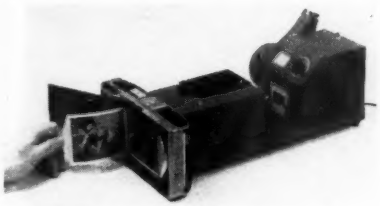
ELECTRONIC FLASH

(*continued from page 28*)

lb., 600-watt-second AC portable with a 6 to 8 sec. recycle time.

Polaroid copy unit

A most useful device for copying slides, the Polaroid 35mm Slide Copier, incorporates electronic flash. It neatly packages a special Polaroid camera, slide carrier, flash unit and power supply. The slide is examined on a special ground glass viewer before copying. On the basis of this examination, the output of the flash unit is adjusted with a seven-position switch. A blower is provided to remove the dust from the slide before it is positioned in the slide holder (the blower is also used to dry the processed copy print). The shutter trips the flash unit and the exposure is made. It is a most clever arrangement, enough to make any owner want to use Polaroid film like mad. Next year the PPofA will return to, Chicago for its conferences, sessions and exhibits. Advance notice will be carried in PMI.—THE END



Polaroid 35mm slide copier

GRAPHIC ARTS

(*continued from page 22*)

Since the masks need not be sharp a masking scanner can be a less complicated instrument than one which must reproduce fine picture detail. In addition, plug-in circuitry makes it possible to quickly change the masking function of the scanner.

While this machine has been produced for experimental studies only, experience to-date indicates the possibility of significant commercial advantages. Many types of masks can be produced that would be impossible or prohibitive to duplicate by manual means. Standard separations produced on conventional equipment complemented by the masking scanner could prove to be a very desirable combination.

(From "A Scanner For Making Photographic Masks," by J. H. Worth, D. J. Howe and R. E. Maurer, Eastman Kodak Research Laboratories, a paper presented at the 11th Annual Meeting of the Technical Association of the Graphic Arts.)—THE END

DEPENDABLE PROCESSOR AT A LOW PRICE!

LABMASTER

Without a doubt the greatest processor value ever offered! Simplified design and volume assembly-line production make it possible to price the Labmaster far lower than any machine of comparable high quality. In comparing cost, remember the Labmaster price includes refrigeration system, air compressor, turbulation pumps and film magazines. It is complete, ready to operate.

- All tanks, stainless steel.
- Neg-Pos., Reversal & Microfilm models.
- Modular construction. Reversal section easily added to neg.-pos. model at a later date.
- Fully automatic, easy operation.
- Exclusive H-F clutch drive eliminates film breakage.
- Built-in refrigeration maintains proper solution temperatures.
- Operates up to 40 f.p.m.
- Turbulation pumps on developer tank.
- Built-in air compressor.
- Variable heat and filtered air in dry box.

(Neg.-Pos. Model) COMPLETE **$4,175** *Nothing else to buy*

HOUSTON FEARLESS

See us at the SMPTE Convention, New York Space Nos 7 and 8

HOUSTON FEARLESS CORPORATION
11845 W. Olympic Blvd., Los Angeles 64, Calif.
Please send catalogs and prices on:
☐ B&W Labmaster ☐ Color Labmaster
☐ Camera heads ☐ Tripods ☐ Camera pedestals
☐ Dollies ☐ Remote control heads
Name_____
Firm_____
Address_____
City_____ Zone____ State_____

Get more information. Circle 505, page 81

first IN EDITING EQUIPMENT

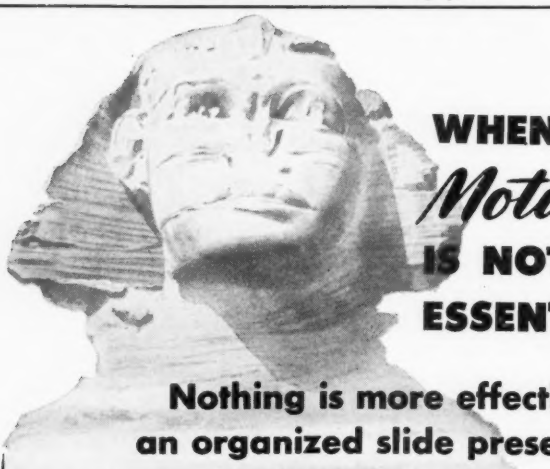
From the time motion pictures "learned to talk" Moviola has earned acceptance as the word for professional film editing equipment. Moviola is keeping pace with the changing needs of the Motion Picture Industry with new devices such as:

- Crab Dolly for improved Motion Picture and TV Camera mobility
- 70 mm Viewer for the Photo Instrumentation field

Moviola MANUFACTURING CO.

1451 GORDON STREET • HOLLYWOOD • CALIFORNIA • HO. 7-3178

Get more information. Circle 473, page 81



WHEN *Motion* IS NOT ESSENTIAL...

Nothing is more effective than an organized slide presentation!

Colburn Custom Services...

Integration of your original miscellaneous transparencies, photographs and artwork, into an effective, easy-to-manage presentation

- Film strips
- Duplicate slide sets
- Sound recording
- Title services

GEO. W. COLBURN LABORATORY, INC.

164 No. Wacker Drive, Chicago 6
Telephone DEarborn 2-6286

Get more information. Circle 420, page 81

(*continued from page* 32)

problems. What does not seem to improve is the quality of the people who show films. Very often movies are shown by someone who can be spared easily, like an office boy, or by a teacher who has had 20 minutes of instruction from someone who had 20 minutes of experience.

An important aspect of the projection problem is economic. Bad projection ruins films. Prints get torn and scratched. Rental libraries consider 50 showings the life of an average print. This means that a half hour color print which costs about $125 costs $2.50 for each projection. There is no reason why a print, if properly projected on good equipment kept in good order by an experienced projectionist, should not be good for at least 500 showings, cutting the cost per show to 25 cents.

Screens also present a problem. A beaded screen is most efficient when viewed directly in line with the projector, when it will reflect more than five times the light of a matte screen. But a viewer sitting at ten degrees off center receives only half the light, the viewer at 35 degrees 1/10 of the light. On the other hand, a matte screen will reflect about 90 per cent at ten degrees and 78 per cent at 35 degrees. More recently introduced lenticular screens have different properties. But except in unusual cases the film maker is at the mercy of what is available.—THE END

A COURSE IN FILM PRODUCTION

Lectures on basic film making theories and demonstrations in the use of professional and semi-professional equipment; visits to studios for work in cinematography, editing and sound recording. Members of the class participate in making a short documentary film from script to finished print.

Arnold Eagle, Fall and Spring. Thursdays, 8:10 to 11:10 p.m., beginning September 24 and February 11. $100; materials fee, $10. (No single admissions.) Class limited to 18. Three field trips, to be arranged on weekends, in addition to class sessions.

THE NEW SCHOOL FOR SOCIAL RESEARCH
66 West 12th St., New York City

DIRECTORY OF INDUSTRIAL DEALERS

These firms are specialists in sales and service for photography in industry — for complete satisfaction all ways, always buy from your local industrial dealer

CALIFORNIA

The Harwood Co.
1141 West Valley Blvd.
Alhambra—CU 3-6551

Suppliers, Inc.
2037 Merced St.
Fresno—AD 7-2751
Photography is our Business

Lloyd's Camera Exchange
1612 Cahuenga Blvd.
Hollywood—HO 7-7189

Standard Camera Supply
7901 Santa Monica Blvd.
Hollywood—Oldfield 4-1314
Industrial—Graphic Arts—Verifax Supplies

Gordon Enterprises
5362 N. Cahuenga Blvd.
No. Hollywood—ST 7-5267
Rentals—Sales—Service

Hollywood Camera Co.
10611 Chandler Blvd.
No. Hollywood—PO 6-5578
Rentals — 16mm — Still — 35mm — Sales

CONNECTICUT

Jay James Camera Shop
182 Fairfield Ave.
Bridgeport—FOrest 7-6447
"Service and know-how"

FLORIDA

Brandons, Inc.
45 West Duval
Jacksonville—EL 4-9061
Cameras for Industry & Fun

ILLINOIS

Altman Camera Company
16 South Wabash Ave.
Chicago—ANdover 3-0751
Chicago's Largest Camera Store

ILLINOIS (cont.)

Standard Photo Supply Co.
43 E. Chicago Ave.
Chicago—SUperior 7-3124
Specialist to the Professional

Watland, Inc.
7724 South Claremont Ave.
Chicago—PRospect 8-4400
Specialist in Photography for Industry.

Oak Park Camera Co.
1023 Lake Street
Oak Park—Euclid 6-6447
Professional — Industrial — Audio Visual

Klein's Photo Center
225 Washington St.
Waukegan—ON 2-4530
Equipment — Supplies — Sales — Rentals

INDIANA

Hoosier Photo Supplies, Inc.
51 Monument Circle
Indianapolis—ME 2-2531
Industrial — Graphic Arts — Verifax — Retail

KANSAS

Bob Gaskin's Industrial Photo Sales
631 E. Harry
Wichita—FO 3-4746

NEW JERSEY

Schaeffer Camera Co.
89 Halsey St.
Newark—MAin 2-2383
52 Yrs. Servicing Photo Ind.

NEW YORK

Stickley-Siver, Inc.
59 Carroll St.
Binghamton—RA 4-4336
Covering Triple Cities, Elmira, Scranton and Ithaca

NEW YORK (cont.)

Aims Photo Equip. & Supply
133 Park Ave.
Brooklyn—Ulster 2-7300
S. Westchester, Nassau
Call Collect Enterprise 4441

Beverly Photo Supplies, Inc.
1760 Nostrand Ave.
Brooklyn—Ulster 6-8184

Spies' Camera Shop, Inc.
933 Franklin Ave.
Garden City—Pl 6-4687
Industrial—Verifax—Graphic Arts

Broadway Camera Shops, Industrial Dept.
870 Broadway
New York—AL 4-8021

Photographic Equipment & Research Center, Inc.
728 Lexington Ave.
New York—Plaza 8-0345
P.E.R.C. Solves problems

World Camera Co.
80 Wall St.
New York—HAnover 2-8060
"Trade-In-Specialists"

Attention Industrial Dealers

If you qualify, write for requirements for listing on this page.

Advertising Manager,
PMI
33 W. 60th St.
New York 23, N. Y.

OHIO

Industrial Photo. Suppliers
206 East Market St.
Akron—BLackstone 3-3149
Methods and Materials Applied to Industry

Metzger Photo Supply Co.
1091 S. Main St.
Akron—JEfferson 5-2693
Everything Photographic

The Dodd Company
1025 Huron Road
Cleveland—MAin 1-0564

Arlington Camera Center
2118 Tremont Center
Columbus — HU 6-2684 — HU 8-9444—Audio Visual—Rental—Sales—Service

OKLAHOMA

Engler Photo Supply Co.
1643 South Boston Ave.
Tulsa—LUther 4-3501
"The Best Costs No More"

PENNSYLVANIA

Greensburg Photo Supply
135 S. Pennsylvania Ave.
Greensburg—GR 2263
Industrial Professional Graphic Art Supply

Kadet Photo Supply Co.
1020 Fifth Avenue
Pittsburgh—COurt 1-7258
Everything Photographic

TEXAS

Patterson Photo Supplies
718 N. Stanton
El Paso—KEystone 2-6956
"Professional, Industrial, Commercial Sales"

Fairchild Camera & Instrument Corporation adds just one more tribute to the finest data recording film ever produced . . .

Ansco HYSCAN

Ansco Hyscan® film, designed specifically for data recording work, has proved its superiority almost from the first day of introduction. Engineers, physicists and technicians can now use this superior emulsion for recording transient traces of all kinds including the phosphor emissions. Hyscan's high effective speed and ultra-rapid processing adaptability is ideal for all critical work.

Says Raul Frye, Assistant General Manager Defense Products Division, Fairchild Camera & Instrument Company, "The film (Hyscan) provided the highest resolution at the fastest speed—a combination necessary for the proper operation of the Camera-Processor AN/GSS5, utilizing the Fairchild thixotropic process with variable time cycle, adjustable in accordance with developing speed which must vary from one to sixteen inches per second."

If you are engaged in work requiring Hyscan's characteristics, do as Fairchild did and call or write Ansco, Binghamton, N. Y., A Division of General Aniline & Film Corporation.

Ansco

Hyscan

Get more information. Circle 401, page 81

MOTION MEASUREMENT

An important technique for the measurement of motion is the use of high-speed motion picture cameras. In this treatise on the subject—based on a paper read at the Purdue University-Machine Design Fifth Conference on Measurements, and an article in Machine Design—William G. Hyzer, a Janesville, Wis., consulting research engineer, discusses what available high-speed equipment will do, how to get the data off the film and how to determine the accuracy of the data

HIGH-SPEED CINE CAMERAS

There are several excellent 16mm high-speed cameras designed specifically for motion-analysis work. These include the Beckman and Whitley Dynafax, the Fastax, the Magnifax, the Fairchild (*Fig. 1*) and the Photosonics Inc. cameras.

The Magnifax camera operates at speeds from 300 to 3000 frames per sec. The Fastax operates at speeds up to 8000 pictures per second while the new Dynafax goes to 25,000 16mm frames per sec. These cameras, with the exception of the Dynafax, depend on a rotating prism located between the lens and the film plane to compensate for image movement during the brief exposure cycle of each frame. Light from the lens to image is refracted by the rotating prism in accurate synchronism with the continuously moving film to produce a blur-free image. The Dynafax camera, on the other hand, utilizes a rotating octagonal mirror which spins in synchronism with the continuously moving film to lay down a series of short duration exposures. Picture frequency required to stop motion is determined by:

$$F = \frac{0.4KV \cos\phi}{WB} \quad (1)$$

As a general rule, image blur B should not exceed 0.002 to 0.003 in.

For the rotating prism cameras mentioned, film velocity through the camera is not constant, but at the higher camera speeds is continuously accelerating until the end of the film is reached. Film in the Dynafax camera is mounted on the inside of a high-speed rotating drum which is brought up to a constant speed as indicated by a tachometer built into the camera. With the Dynafax, picture frequency at the time of exposure is constant and is known precisely to within ± 3 per cent as read on the tachometer and to within ± .02 per cent as read by an external electronic counter.

Time interval between frames with rotating prism cameras, however, is determined by exposing timing marks on the edge of the film with light pulses generated at a known frequency. The timing lamp for producing these pulses is an integral part of commercial cameras and consists of a neon lamp fired by an external 60-cycle source or an oscillator of controlled frequency. Ordinary 60-cycle sources are usually accurate to within one per cent. Crystal-controlled oscillators are stable to within several parts per million per deg C. More information on the operational characteristics of high-speed movie cameras is given in References 1 and 2 (tabulated at end of article).

(*continued on next page*)

Figure 1 Author shown with several of the cameras described: (L-R) the Dynafax, the Fastax, the Magnifax and the Fairchild.

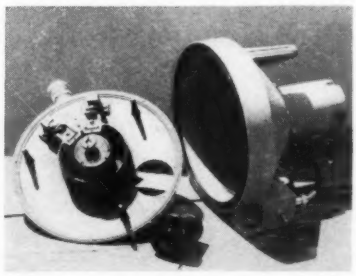


Figure 2 Interior of Dynafax camera. *Left:* octagonal mirror and optical system housing; *foreground:* cassette for transferring film to and from camera drum; *right:* rotating drum and drive motor assembly. Camera makes 224 16mm frames on 35mm film.

FILM ANALYSIS EQUIPMENT

Generally the field of high-speed movie analysis can be bisected into two distinct categories—qualitative and quantitative. The first is simply visual observation of the projected image. The latter deals with the mathematical methods by which numerical data are obtained from the film image.

This latter technique is commonly referred to as micromotion analysis. Probably 90 per cent of industrial high-speed films are intended for visual analysis of the projected image. Examination is facilitated by using a reversible projector which can also be stopped for single-frame projection. Critical areas of the film can be run back and forth or stopped for detailed study.

Visual analysis places the entire responsibility for analytical judgment upon the human eye, a device which is largely influenced by variable psychological and physiological factors. Several characteristics of the visual process limit its effectiveness as an analytical instrument. Table 1 compares the minimum percentage instantaneous change in velocity that can be detected by visual and by quantitative methods.[3]

In contrast to visual analysis, quantitative methods make use of dimensional-change measuring equipment to determine image displacement from frame to frame and corresponding time intervals. From these data, measurements can be obtained on velocity, acceleration, actuation time, etc.

The optical comparator, the measuring microscope, and even photographic projection equipment can be effectively adapted for measuring dimension changes on movie film, depending upon the accuracy of the required results.

Table 1—Sensitivity of Motion-Analysis Method

Number of Frames Devoted to Action	40 or more	30	20	10
Minimum Velocity Change Detectable by Eye *(per cent)*	10	15	30	60
Minimum Velocity Change Detectable by Quantitative Analysis *(per cent)*	½	½	⅜	2

Optical Comparator

Adaptation of the comparator and microscope to the measurement of photographic images usually involves nothing more than keeping the film in a fixed position within the optical field of the instrument. With the comparator, the stage holding the film is normally moved through the field by two vernier screws located at right angles. The image is projected upon a large translucent screen where cross hairs are imprinted. Image position is determined by reading two verniers when the image is correctly aligned with the cross hairs. The film should be maintained flat on the stage of the instrument by sandwiching it between two pieces of glass.

Microscope

The measuring microscope is usually designed with a graduated reticle in the eyepiece. In this case, the film is mounted on the stage of the microscope between glass to maintain flatness. The proper magnification is chosen for the particular image to be analyzed. It is usually necessary to calibrate the reticle for the specific magnification employed. Field coverage of the microscope limits the efficiency of this system for film analysis.

Projector

Film measurements, using conventional photographic projection equipment, are accomplished by projecting the image onto a screen, either reflecting or preferably translucent; where the image dimensions can be scaled off. Care must be taken to align the screen accurately, perpendicular to the optic axis of the lens. A translucent screen observed from the side opposite the projector is most convenient to use.

Film-Motion Analyzer

A convenient film-measuring instrument is a film-motion analyzer designed specifically for this application, Fig. 3. In an instrument of this type, film can be either manually or automatically transported. The equipment utilizes movable cross hairs on a translucent viewing screen, and a rotatable projection head for obtaining accurate linear and angular measurements.

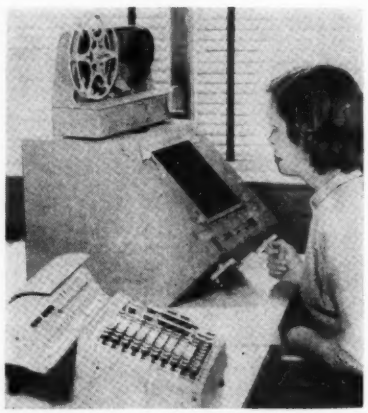


Figure 3 Projector designed to measure incremental changes of position of subject frame to frame. Vernier-driven cross hairs position to .0001 in. relative to the film.

Nomenclature

- B = Image blur, in.
- D_o = Object distance, in.
- D_t = Distance between timing marks, in.
- E = Absolute error in measuring the distance between two objects, in.
- F = Picture frequency, frames per sec.
- K = Camera shutter constant (0.6 for Fairchild and Fastax, 0.3 for Magnifax and 0.031 to 0.155 for the Dynafax, depending upon diamond stop setting.)
- L = Focal length of lens, in.
- M = Image magnification
- N = Number of frames in sequence to be analyzed
- S_d = Standard deviation of individual measurements of distance between timing marks, in.
- S_i = Standard deviation in measuring cross hair alignment with an image, in.
- S_m = Standard deviation in measuring the distance between a stationary and moving object in the subject field, in.
- S_o = Standard deviation in measuring the distance between two sharply defined objects in the subject field, in.
- S_p = Standard deviation in measuring elapsed time between frames bracketed by two timing marks, sec.
- S_r = Standard deviation in measuring distance between two reference images, in.
- S_v = Standard deviation in measuring average subject velocity, in. per sec.
- V = Subject velocity, in. per sec.
- W = Field width, in.
- $\varnothing$ = Angle between line of subject motion and film plane, deg.

TECHNIQUES OF ANALYSIS

Reduction of dimensional and time data from the motion-picture film is a straightforward operation permitting both accurate and rapid analysis. The analyst has a choice of several procedures depending upon the nature and quantity of the film data, the analytical equipment available, and the accuracy requirements.

The first step is to view the films either on a screen or in an editor and pick out the sequence of frames to be further analyzed. The first and last frames in the sequence are usually notched or otherwise marked for ready identification. Then the position of the timing mark corresponding to the first and last frames in the sequence should be marked on the film edge. With the Fastax camera in Fig. 1, the timing mark precedes the photographic image by five frames. In the case of the Magnifax camera, the timing mark is ten frames following the photographic image. This operation is not required with the Dynafax, which does not employ timing marks.

As the next step, image displacement in each successive frame is measured by the use of a suitable reading device and data are listed as shown in the second and third columns of the table in Fig. 4. Additional columns can be provided for tabulating the *Y* co-ordinates of displacement data and the *X* and *Y* co-ordinates of other actions evident in the films. In this example, a stationary reference mark is included in the tabulation in addition to the co-ordinate points determined by the trajectory of the motion under investigation. Subtracting the *X* co-ordinates of the reference point from the *X* co-ordinates of motion compensates for any error introduced by camera movement or by bounce and weave of the film through the camera.

Scale Factor

At this point, image-displacement data are converted to actual object-space dimensions by multiplying by a scale factor. This factor is equal to the reciprocal of the image magnification. It is obtained by measuring the image distance between the leading edges of two objects separated by a known distance or less accurately by calculation based on lens focal length and object distance:

$$M = \frac{D_o - L}{L} \qquad (2)$$

Significant error may be introduced if the overall image size of a known object is measured to determine magnification. This effort is treated under "absolute-distance" error.

Data Reduction

The next step in the analytical procedure is the determination of time intervals between frames. This is usually expressed as total elapsed time from frame zero to the frame number under study. In other words, frame zero corresponds to zero time. Starting with zero time point, the linear distance to each successive timing mark is determined and the data tabulated as shown in Fig. 5. The first column of tabulation in Fig. 5 gives the total elapsed time between timing marks, starting with the first timing mark beyond zero time point. The time interval between successive marks is determined by the frequency of the light pulses from the timing lamp. The second column in Fig. 5 shows the linear distances between the first timing mark and each consecutive time interval listed in the first column. Column 3 is a tabulation of timing-mark distances in frame units. These data are obtained by dividing the values in Column 2 by the pitch of the film, which in this case equals 0.3 in. These data are now ready for graphical presentation.

Total-elapsed-time values from Column I in Fig. 5 are plotted as ordinates and total timing-mark distances in frames from Column 3 as abscissas in Fig. 6. This curve relates total elapsed time with frame number. Time values from the curve are shown in Column 4 of the table in Fig. 4. Columns 2, 3, and 4 in Fig. 4 relate total elapsed time with total image displacement. These data can be further differentiated to determine acceleration and velocity.

Time Calibration

Ordinarily, it is unnecessary to use a film reader to process timing-mark data. An accurate 36-in. steel rule with 1/64-in. graduations is satisfactory for this job. The film-strip is laid down on a flat, light-colored or transparent surface so that the marks are clearly visible. If the end of the scale is positioned with the zero time point on the film, the timing mark distances can

(*continued on next page*)

Frame No.	X Co-ordinate of Moving Image (in.)	X Co-ordinate of Stationary Image (in.)	X Co-ordinate of Image Displacement (in.)	X Co-ordinate of Object Displacement (in.)	Elapsed Time (millisec)
1	0.1437	+0.0001	0.1436	0.4308	0.00
2	0.1430	+0.0001	0.1429	0.4287	0.15
3	0.1424	−0.0001	0.1425	0.4275	0.30
4	0.1418	−0.0002	0.1420	0.4260	0.45
5	0.1413	+0.0001	0.1412	0.4236	0.59
6	0.1406	−0.0003	0.1409	0.4227	0.74
7	0.1401	+0.0001	0.1400	0.4200	0.89
8	0.1445	+0.0003	0.1442	0.4326	1.03
9	0.1438	−0.0001	0.1439	0.4317	1.18
10	0.1433	0.0000	0.1433	0.4299	1.33
71	0.0257	+0.0002	0.0255	0.0765	9.45
72	0.0172	−0.0001	0.0173	0.0519	9.60
73	0.0086	0.0000	0.0086	0.0258	9.74
74	−0.0001	−0.0001	0.0000	0.0000	9.88
75	+0.0001	+0.0001	0.0000	0.0000	10.12

Figure 4 Typical list of data to record image displacement from frame to frame. Additional columns can be provided to tabulate Y co-ordinates.

be read quickly and accurately.

Absolute duration and velocity measurements can be obtained only when the period between successive frames can be found in absolute time units. Relative velocities, accelerations, and time intervals can be determined without any knowledge of the exact period between frames. In this case, all the analyst needs to know is the rate at which the picture frequency is changing throughout the filmstrip being analyzed. If the filmstrip consists of only a few frames, the period between frames can be assumed constant. The maximum time variation between consecutive frames exists at the beginning of the film, within the first 20 ft. where the acceleration through the camera is the greatest.

Total Elapsed Time (millisec)	Timing-Mark Distance (in.)	Timing-Mark Distance (frames)
1	2.126	6.758
2	4.054	13.513
3	6.086	20.286
4	8.121	27.071
5	10.159	33.864
6	12.199	40.664
7	14.244	47.479
8	16.292	54.305
9	18.341	61.135
10	20.394	67.979
11	22.450	74.833

Figure 5 Typical tabulation of timing data from high-speed film.

Expected Variations

If it is assumed that the picture sequence to be analyzed is not part of this starting transient, the greatest time variation that will ordinarily be encountered is about 0.05 per cent per frame. This means the period between successive frames will decrease a maximum of ½ per cent in ten frames or 5 per cent in 100 frames.

If an accuracy of ±1 per cent is adequate, and the picture sequence consists of 40 frames or less and is not part of the starting transient, it is safe to assume a constant time duration between frames. For an accuracy of ±½ per cent, the same assumption can be made for a strip consisting of 20 frames or less.

When more than 40 frames are to be analyzed, or if the sequence is taken from the first 20 ft. of film, it will usually be necessary to correct for time variation between frames.[3] No time correction is required with the Dynafax.

ERRORS OF MEASUREMENT

The overall dimensions of a 16mm film frame are 0.3 by 0.4 in. Experience has demonstrated that the minimum practical standard deviation, S_i, of individual measurements in defining the edge of a sharp, high-contrast image is ±0.0001 in. Actual values may exceed this value by two or 3 times if the image quality is not optimum. According to statistical theory, 68 per cent of all individual measurement readings will be within one standard deviation of the mean, 95 per cent for two, and 99.7 per cent for three.

Error is greater for blurred images as expressed in the following equation:

$$S_i = B\,(7.5 \times 10^{-3}) + 10^{-4} \qquad (3)$$

Image sharpness is dependent upon several factors: 1. Resolving power of the optical system. 2. Resolving power of the photographic emulsion. 3. Accuracy with which the lens is focused on the subject. 4. Degree of image blur caused by subject or camera movement during the interval of exposure. Nature of the image is determined by the characteristics of the subject photographed. Factors that are important from a measurement standpoint are contrast of the subject and sharpness of the lines or edges to be measured on the subject.

Random-Distance Error

Reproducibility of measurement is influenced appreciably by the contrast and sharpness of the reference lines on the subject. Measurement accuracy is improved by using sharp, high-contrast line if care is taken not to overexpose the highlights and cause bleeding into the underexposed regions.

A 30 per cent increase in measurement accuracy is obtained by using a high-contrast reference line painted on a typical object to be measured.[4] Optimum reference-line width is about 0.006 in. in terms of image dimensions or one to two per cent of the subject field width, W. Minimum practical standard deviation of individual measurements of distance between two reference lines is $S_r = \pm 0.00014$ in.

The standard deviation in measuring the distance between two sharply defined objects in the subject field is given by

$$S_o = \pm\ 35 \times 10^{-5}\ W$$

Again actual measurements may exceed this value by a factor of several times if image quality is poor.

As previously stated, a stationary reference within the field of view is normally recommended. Minimum standard deviation in measuring the distance between a stationary line and a blurred moving reference line in the object space is typically:

$$S_m = 10^{-4}\sqrt{12.5W^2 + 187\,\frac{WKV}{F} + 5600\left(\frac{KV}{F}\right)^2} \qquad (4)$$

Absolute-Distance Error

When attempting to measure the position or size of a blurred image, an absolute error is introduced in visually determining the exact edge of the image. An observer will normally bisect the area of blur with the cross hairs to locate the apparent edge of the image. Because of a nonlinear density gradient across the blurred area, however, the actual midpoint of blur does not coincide with the apparent midpoint. The effect becomes negligible for blur less than 0.001 in. It may be significant in many practical cases where the blur exceeds this value, particularly when measuring motions of changing velocity such as a vibrating spring.

As an example, suppose the vibration of a spring is being analyzed. It oscillates in simple har-

monic motion at a frequency of 50 cps and with an overall amplitude of ½ in. This spring is photographed using a field width of 1 in. at a picture frequency of 2000 frames per sec. Absolute measurement error caused by image blur will result in a distortion component that is 90° out of phase with the primary wave and has an amplitude four per cent of the amplitude of the primary vibration to be measured. Correction for this error in measuring the distance between two identical reference lines is obtained by adding one-half the difference between the measured widths of the two lines to the measured distance between the leading edges of the two lines. This introduces additional random error, but it is a necessary compensation in cases of excessive blur.[5]

Typical absolute error in measuring the distance between a blurred, high-contrast moving object and a stationary reference object is given by

$$E = \pm\left(0.46\,\frac{KV}{F} - 1.25\times10^{-3}\,W\right) \quad (5)$$

This equation is void if the value within the brackets becomes negative. Absolute error is positive for a black image moving away from the reference image or a white image moving toward the reference image. Absolute error is negative for a black image moving toward the reference image or a white image moving away from the reference image.

Distortional Error

Other absolute errors in measuring image position are introduced by dimensional instability of film and optical-distortion effects. Shrinkage characteristics of film[6] are shown in Table 2. Typical optical distortional errors for high-speed cameras[4] are only about 1 per cent vertically and ¼ per cent horizontally.

Table 2—Dimensional Stability of Cellulose Triacetate Base

	Change in Film Width (per cent)	Change in Film Length (per cent)
Processing Shrinkage	0.06	0.07
Humidity Expansion, at 10 per cent rel. humid.	0.07	0.08
Thermal Expansion, at 20 C.	0.06	0.07
Aging Shrinkage in 1 yr at 78 F and 60 per cent rel. humid	0.16	0.13

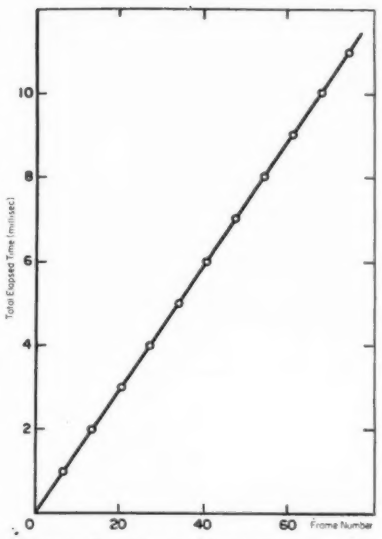


Figure 6 Time-calibration curve for correcting camera acceleration characteristic. Data obtained from Columns 1 and 3 of Figure 4.

The fact that shrinkage and optical distortion are directional effects emphasizes the importance of including a suitable scale in the field of view, parallel and in close proximity to the object path. Optical distortion is least in the center region of the film frame and is negligible for horizontal motion with an amplitude less than ⅝ of the field width.

Time Error

Standard deviation of average elapsed time between any two frames bracketed by two timing marks is

$$S_p = \frac{(N-1)S_d}{FD_t} \quad (6)$$

A typical value of S_d using a 60 cps light source and a Fastax camera at 1000 fps is $\pm5\times10^{-3}$ in.

Error in measuring the duration of an action that is observed commencing on one frame and terminating on a latter frame is roughly $\pm1/F$.

Velocity, Acceleration Errors

Random error in measuring velocity, S_v determined by total object movement between any two frames is given by (7)

$$S_v = \pm\frac{F}{N-1}\sqrt{2S_m^2 + S_p^2\,V^2}$$

Instantaneous velocity is obtained by measuring the image displacement during the time interval between two successive frames. In this case, N in the above equation equals 2.

Practical tests run by the University of California Institute of Transportation and Traffic Engineering using combined graphical and analytical methods have shown that an accuracy of ± 1 per cent is attainable in the measurement of acceleration.[7]

Sample Problem

Determination of the actuation characteristics of a small solenoid is illustrative of a typical application of micromotion analysis using high-speed cinematography. Assume that the solenoid is set up to trigger two precision snap-action switches in sequence. The actuation time and maximum armature velocity are critical to its effective operation. Velocity must not exceed 100 in. per sec. over any 1 millisec. interval. Black reference lines are painted on the armature and the stator against a white background. Relative movement between the stator and armature will be measured and plotted relative to elapsed time to obtain the required data.

Total armature movement is 0.440 in. Actuation time is estimated at 10 to 15 millisec. Value of maximum velocity is 100 in. per sec. A 500 cps oscillator is used as a time standard. Based on Equation 1 and an estimate of solenoid velocity characteristics, camera frequency is determined. A speed of 6,500 frames per sec. at a field width of 1.2 in. is chosen for $K = 0.6$ and $B = 0.003$ in.

By the process of counting individual frames, actuation time can be estimated to within $\pm1/F$ or ±0.15 millisec. Greater accuracy can be obtained from the time-displacement curve. From Equation 4, $S_m = 9\times10^{-4}$ in. From Equation 5, $S_p = 2.4\times10^{-6}$ sec. based on $S_d = 5\times10^{-3}$ in. Random error in determining velocity, S_v, is obtained by the use of Equation 7 and equals 1.3 in. per sec. Therefore, at the 100 in. per sec. velocity

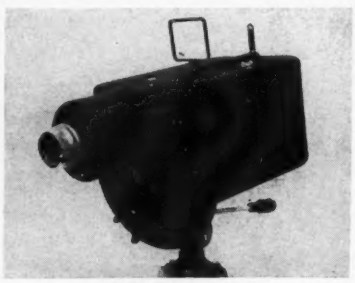
(*continued on next page*)

Hulcher

70mm Sequence Camera

A New High in Industrial Press & Research Photography

● Studio Quality ● Movie Speed



MODEL 702—20 F.P.S.

Check These Features

☐ **EXPOSURE** — May be set independent of FRAME RATE. Available range 1/25 to 1/2880 sec.

☐ **LENSES** — Any lens from 3 to 80 inch focal length may be used. Bayonet type mounting. 6⅜" f4.5 Raptar lens is standard.

☐ **FOCUSING** — Full size ground glass with hood and magnifying lens. Mirror return is automatic.

☐ **SINGLE FRAME** — or pulse operation optional. Remote or local control rates up to 5 per second.

☐ **SEQUI-STROBE** — Straitman Fast Repeating Electronic Flash—synchronized with the camera—provides up to 20 flashes per sec. guide No. 100 with TRI-X film.

☐ **POWER** — Cameras available for use with 12 VDC-24 VDC or 115 VAC.

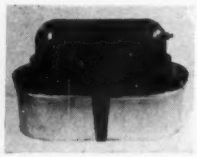
☐ **FILM**—Standard 70 mm perforated film on 100' spools available in many emulsions.

☐ **SPECIAL FEATURES**—Available with adjustable mid shutter pulse-Timing and events marking lamps—FIDUCIAL marks or other features as required.

Hulcher

GILCO 70mm FILM PROCESSING UNIT

For excellent processing 100 to 200 foot rolls of 70mm black-and-white or color film



Operated electrically from 115v AC power or by hand.

Large diameter stainless steel reels transport the film from one reel to the other in less than 30 seconds. At all times 48 inches of the film emulsion is exposed to agitated chemicals.

May be used without a darkroom if necessary. Reel assembly is equipped with legs which allow it to operate out of the tank for required light exposure in color film developing.

Charles A. Hulcher Company, Inc.

911 G. STREET HAMPTON, VIRGINIA

PHONE: CHesnut 5-6190

Get more information. Circle 447, page 81

MOTION MEASUREMENT

(*continued from page 67*)

level, there is 95 per cent confidence that random-measurement error in determining average velocity over a six-frame interval will not exceed $2S_v$ or 2.6 per cent. At the 99.7 per cent confidence level, error will not exceed $3S_v$ or 3.9 per cent.

Displacement and time data are shown in Fig. 4 and 5. A time displacement curve is drawn in Fig. 7. From this curve, actuation time is found to be 11.2 millisec. and maximum velocity to be 189 in. per sec. Measurement error can now be recalculated using the more accurate data from the curve.

REFERENCES

1. W. G. Hyzer—"High-Speed Photography in Product Development," MACHINE DESIGN, Vol. 27, No. 2, Feb. 1955, pp. 150-158.
2. W. G. Hyzer—"High Speed Photography," *The Tool Engineer*, Vol. 36, No. 6, June 1956, pp. 67-72.
3. W. G. Hyzer—"Analysis and Interpretation," *Industrial Photography*, Vol. 4, No. 6, Nov.-Dec. 1955, pp. 22-25, 76-77.
4. W. G. Hyzer—"Some Practical Considerations in the Analysis of High-Speed Motion-Picture Data," *Journal of the SMPTE*, Vol. 66, No. 6, June 1957, pp. 357-360.
5. W. G. Hyzer—"Analysis of Oscillatory Motion Using High-Speed Photography," *Product Engineering*, Vol. 27, No. 6, June 1956, pp. 135-139.
6. C. R. Fordyce, J. M. Calhoun and E. E. Moyer—"Shrinkage Behavior of Motion-Picture Film," *Journal of the SMPTE*, Vol. 64, No. 2, Feb. 1955, pp. 62-66.
7. Derwyn Severy and Paul Barbour—"Acceleration Accuracy," *Journal of the SMPTE*, Vol. 65, No. 2, Feb. 1956, pp. 96-99.

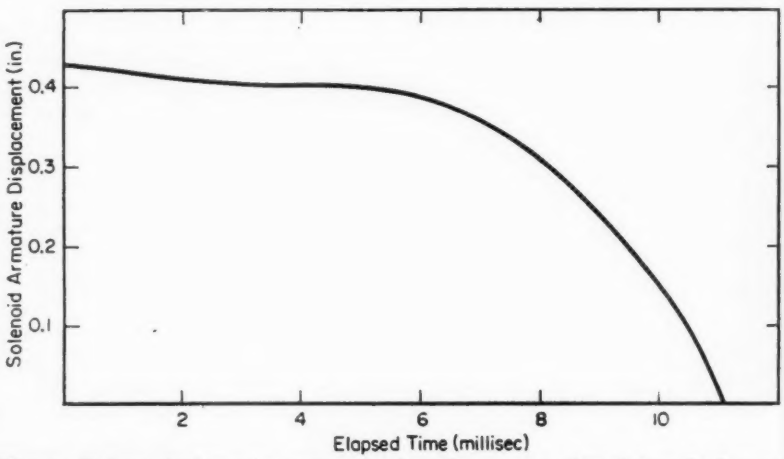


Figure 7 Time-displacement curve of solenoid armature plotted from high-speed movie films. Curve shows armature was actuated 11.2 sec.

HOW TO SUBMIT MANUSCRIPTS

We're often asked if we buy material from readers. Sure we do; everybody does. PMI welcomes, and pays on acceptance for articles of interest and benefit to photographers in commerce, industry, education and government. If you do a short piece, say on how to ding up a prewar Speed Graphic to make streak pictures we'd appreciate seeing the complete story. If your idea is of wider scope, we'd rather see a one paragraph summary first. Manuscripts and queries are acknowledged on receipt by post card, we try to give decisions as quickly as possible on whether we'll buy your material. Unused material is returned *if* you enclose a stamped, self-addressed envelope. Contacts or 8 x 10's are best for pictures. Written material should be typed. Rock-bottom price for a short or pic and caption is $5. We often do better.

C-V CONVAIR

CONVAIR AIRBORNE FREQUENCY MONITORING AND INTERFERENCE CONTROL AIRPLANE USES...

DATASYNC* ELECTRONIC-OPTICAL RECORDING EQUIPMENT

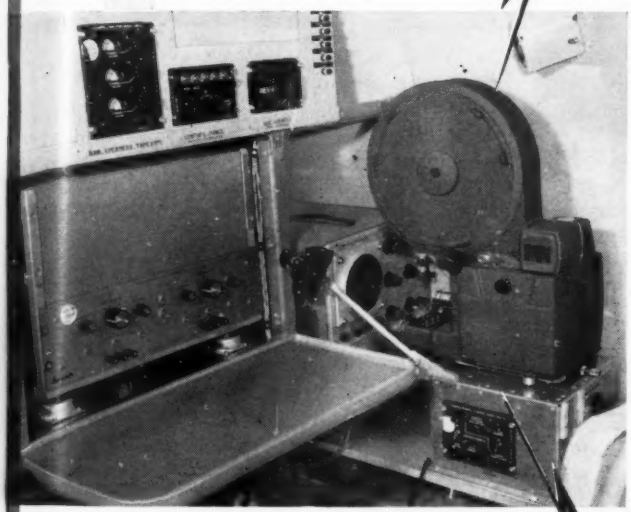
DATASYNC is a new breakthrough in data recording capability . . . combining multi-channel Magnetic-Tape with Optical "Panoramic Video" Picture Data, on a single "Datasync" Film for immediate and reliable self-synchronized "Quick-Look" capability, only minutes after recording!

The **Convair** Division of General Dynamics is producing this Airborne Frequency Monitoring and Interference Control Airplane which carries 51 antennas and uses **Datasync** Equipment to record Panoramic Video optically, plus a "Steno-track" of the intercom conversations between technicians in the aircraft, and between the aircraft and the ground station controls, together with independent recording of time-base signals, etc.

The basic design of this Aircraft is planned for down-range checking at all missile test and launching ranges. It may also be used for checking the functional and electronic environment of DEW Line installations and other defense system ground installations equipped with such components as SAGE "Texas Towers" and "P" Sites.

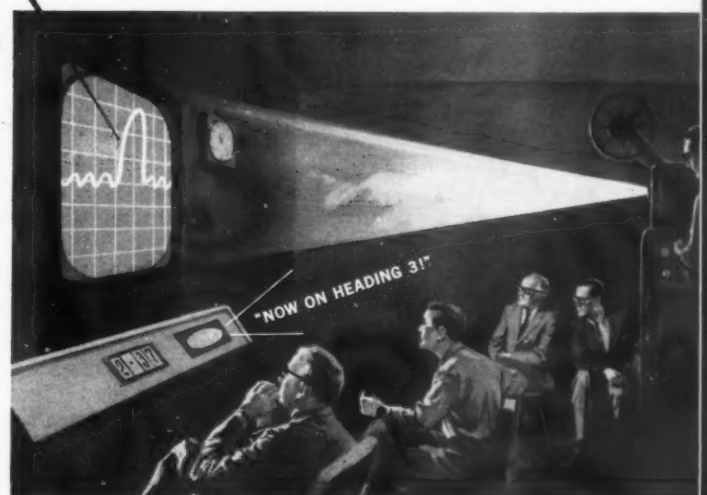
Datasync performance and reliability are guaranteed by Berndt-Bach's experience in manufacturing Electronic-Optical Recording Equipment since 1931.

* Trade Marks of Berndt-Bach, Inc.



There are seven Datasync Systems in each Convair FMIC Airplane, which provide multi-channel magnetic recording of Filmagnetic data in exact synchronism with "scientific shorthand" photographed from oscilloscopes, onto "Photo-Tape." *

The "Quick-Look" Datasync System capabilities of combined photo-recording and multi-track magnetic recording, are unexcelled. **Datasync** eliminates the time-consuming editing usually needed to synchronize the magnetic and photographic types of information.



• *Write for free, full-color illustrated Datasync "Catalog of Ideas"...*

DATASYNC
A DIVISION OF
BERNDT-BACH, INC.
6966 Romaine St., Los Angeles 38, Calif. • HO. 2-0931

ELECTRONIC-OPTICAL RECORDING EQUIPMENT SINCE 1931

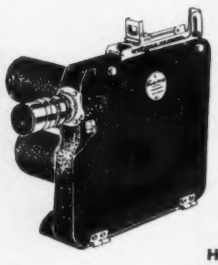
Get more information. Circle 410, page 81

in the

western states

FAIRCHILD

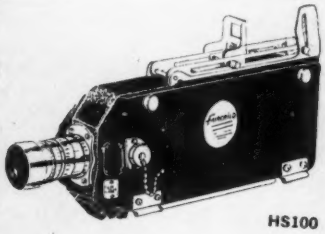
high speed cameras



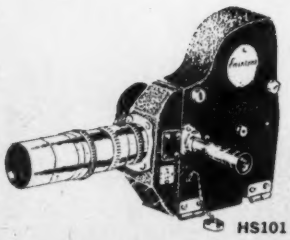
HS401

represented exclusively by

gordon enterprises



HS100



HS101

gordon enterprises

Serving the World

5282 NORTH CAHUENGA BLVD. · NORTH HOLLYWOOD, CALIF.

Get more information. Circle 437, page 81

by Ernest E. Reshovsky

PHOTO

Comprehensive report on the proceedings at the recent SPIE Technical Symposium and Exhiborama of Equipment

More than 1,000 people, interested in the science, attended the three days of meetings and found highly concentrated doses of lectures and discussions on the present and future status of photo instrumentation. (These were true symposiums, with the listeners adding greatly to the value of the meetings by making suggestions and asking questions from the floor.)

Due to excellent handling of the various concurrent sessions by the moderators, the speakers kept their papers and presentations concise, to the point, and in conformity with strict timetables. The consensus of opinion was that everyone attending the sessions profited greatly by the exchange of ideas during the three days.

Most of the time there were two or three Work Shop Sessions running concurrently, and those attending could decide in advance which subject under discussion would be of the greatest value to them.

Range tracking

The first session dealt with Current Applied Range Photographic Instrumentation. This was conducted by a panel of seven experts, chosen expressly with the idea of not representing the philosophy of any one organization, thus giving as broad a cross-section of the subject as possible. Dan Parsons, of the Sandia Corp., discussed tracking telescopes as used by Sandia Corp. at Salton Sea, Calif., Tonopah, Utah and Dalhart, Texas. Sandia is using tracking telescopes for "event and sequence photography" in which they are interested rather than in "documentary photography." With Sandia photographing rocket testing at the launching, tracking telescopes are found most useful for a record in case of rocket failure. Accuracy of tracking is of the greatest importance with extremely long focal length lenses and relatively small 35mm film. Sandia Corp. uses radar slant range information fed into servo-motors to keep telescopes in focus during film run. Parsons pointed out that telescope tracking mounts are still of World War II vintage, although millions are spent on rockets that are being tested and recorded. There is a great need for better tracking mount design. For the future it will be necessary to provide for longer apertures, longer focal lengths and higher frame rates in the recording cameras. There is also quite a need for fully automatic tracking methods. (*See PMI, Apr. 1958 for story on Sandia Corp.*)

The next speaker, S. N. Lipton of J. W. Fecker, discussed cinetheodolites and emphasized the necessity for a complete system to make full use of the high accuracy capabilities of cinetheodolites. He explained the need for very accurate tracking to get most useful data from the instruments. An interesting prediction made by Mr. Lipton was the possibility of raising the cinetheodolites off the ground and high enough into the air to be free from the effect of atmospheric conditions which are liable to degrade images. Balloons or other space platforms were suggested to bring this about.

Charles Clement, of Land-Air, described instrumentation methods at Holloman Air Force Base, home of the world's largest and fastest sled track. There are 72 camera sites at the track, including six tracking towers (three 60-footers and three 15-footers). Mr. Clement talked about track velocities which have to be accurately recorded, i.e. position data to plus or minus 6 in. in 1,000-ft./sec. sled speeds. As speeds increase, time resolution becomes a serious problem and camera synchronization has to be highly accurate. High speed Schlieren photography is planned for a later date.

INSTRUMENTATION

Ed Rich, Space Technology Lab., outlined operational procedures in use with IRBM's and ICBM's. He explained star background calibration in night firings and the necessity of pre- and post-photography calibration to be sure of camera immobility during operation. Mr. Rich talked about extreme position accuracy achieved on the order of four microns with an f/2.8 4½-in. aperture lens. Missile position in space has been located to one part in 100,000 and, in one case on record, to plus or minus 8 ft. in space. He also mentioned that pyrotechnic displays on missiles have been detected by cameras to a distance of 6,000 miles, while strobe-type lamps have been detected to distances up to 520 miles.

Mr. E. P. Martz, of the Scripps Institute of Oceanography, University of California, talked on atmospheric conditions which are an important factor in photo instrumentation over great distances. He described contrast attenuation due to absorption, scattering and emission in earth-bound atmosphere and discussed effects of air glow and aurorae on reduced visibility from 50-500 miles. Again it was pointed out that to circumvent atmospheric disturbances, resulting in reduced image contrast, it is desirable for tracking and observing stations to be elevated to 15 miles or more altitude.

Data assignment criteria

The second session, "Data Assessment Criteria to be Met by Photographic Instrumentation," was presented by a panel consisting of S. M. Lee, U. S. Navy Ordnance Test Center, China Lake, Calif., A. N. deWitt, Edwards Air Force Base, Calif.; J. H. Love, PMR, Point Mugu, Calif. V. P. Principe, Telecomputing Corp. HADC, The moderator was J. F. Gates, Test Data Div. PMR, Calif.

The panel pointed out and discussed undesirable features from a data reduction point of view, solutions of which the panel felt would provide more accurate and faster reduction of instrumentation data.

Some of the features mentioned were shutter inaccuracy and inefficiency, vibration control, better film registration, more efficient format, greater rigidity of camera-lens combination, better contrast control, unsynchronous frame rates, better timing presentation, film processing problems, and operator error due to deficient human engineering.

The subjects presented by the panel led to a lively discussion from the floor, dealing with various deficiencies in present-day equipment. There was great emphasis on cameras and read-out devices designed around the operator. There was also a lively discussion concerning the need for a permanent recording medium that needs no processing at all, due to the various errors and delays inherent in present day procession techniques. This wish for a new type of photographic recording medium was voiced quite often during various other sessions of the discussions, and at times was referred to as "re-usable film, requiring no processing"—an interesting concept for material very much needed.

High in the sky

"Extraterrestrial Photographic Instrumentation" was the title of the next session which was conducted by a panel of six experts. Dr. Sam Bousky, Chicago Aerial Industries, was the first speaker and he discussed problems in high altitude photography. Again the subject of reduction of contrast due to light scattering in the earth's atmosphere was brought out by the speaker. He felt that progress in the field of high altitude photography depends on the capability of recording low contrast detail over long distances. Since test methods for measurement of resolution have recently been standardized, Dr. Bousky thought that progress along the line of recording low contrast subjects would be made. He indicated that progress might be made in improved emulsions, the superposition of images and in the use of stereo photography. He expects to see improvements in acutance in the near future, to the order of ten times higher than at present which, in turn, will permit reduction of focal lengths of lenses and consequently greater area coverage.

Dr. Francis Johnson, Lockheed Aircraft, the next speaker, delivered a paper on scientific uses of photography in space vehicles to acquire spectra data. He pointed out that there were four main reasons for photography in space: 1) to get out of the earth's atmosphere and its disturbances especially to measure ultra-violet radiation; 2) to get far enough away from the earth's surface to get a good look at it; 3) to avoid turbulence in the atmosphere while observing celestial objects; 4) to obtain higher-than-present resolution in the image by getting closer to the subject, moon, planet, sun, etc.

Dr. Johnson pointed to the limitations imposed by the lack of optical materials for wave length regions below 1000 angstroms and the failure of most photographic emulsions below 2,300 angstroms. In this connection he mentioned a new development in photographic emulsion techniques produced by Kodak, France, which consists of a type of low gelatin emulsions, on which the silver bromide crystals are only partially immersed in the emulsion. Since gelatin becomes opaque below the 2,300 angstrom level, the parts of the crystals which actually stick out, uncovered, from the emulsion are used to record in the ultra violet region.

Present day methods are based almost entirely on the recovery ability of the exposed photographic material. Dr. Johnson pointed out that in the future, as vehicle heights increase, it will become necessary to devise techniques for processing film in space vehicles and have methods of scanning and transmitting to ground stations the pictures produced by space photography.

Dr. Robert R. Rapp, Rand Corp. followed, describing objectives in the use of photo data for weather prediction. He pointed out the advantages of high-altitude, large-area photography over previous methods em-

(*continued on page 72*)

reflex!

New 16mm CINE

Direct From Paris!

Pathé

Webo "M" Camera

- Continuous Reflex Viewing—Directly Through Shooting Lens!
- Variable Speeds—8 to 80 Frames Per Second!
- Variable Shutter—from Closed to 180°! No Parallax Worries!
- Motorization Provision: Accessories,
- Time Exposures—Frame at a Time!

FREE CATALOG—132 Pages of Photo Equipment 62nd ANNIVERSARY

• Greatest Lens Offerings! • Cameras — Regular, Industrial and scientific! • Enlargers — Solar etc.! • Lighting etc.! • Accessories —Write to: PMI-959

BURKE & JAMES, INC
321 S. Wabash Chicago 4, Illinois

Get more information. Circle 413, page 81

B G
Library
MOOD & TITLE MUSIC
For Every Type of Production
EITHER ON A "PER SELECTION" OR "UNLIMITED USE" BASIS
AUDIO-MASTER Corp. 15 E. 45th St. New York 17

Get more information. Circle 403, page 81

EKTACOLOR (TYPE C)
CUSTOM PRINTING FROM COLOR NEGATIVES, TRANSPARENCIES AND ARTWORK
BLAKESLEE-LANE, INC.
916 N. CHARLES ST., BALTO. 1, MD. SA 7-8800
Serving industry with photography since 1931

Get more information. Circle 409, page 81

INSTRUMENTATION

(*continued from page* 71)

ploying a large number of isolated measurements. He explained the requirements of a satisfactory system which should permit recording detail of cloud cover, get data relating to temperature and pressure distribution and allow for rapid analysis of the data obtained.

Dr. Paul Lathrop of General Electric talked about design parameters for cameras used in instrumentation of re-entry vehicles. Since the intent is to recover the photographic record, he described such a design project, which produced a compact 16mm camera, built to meet very severe operating requirements. These included high shock forces, compact size, light weight, survival in sea water and high altitude resistance. The experiments so far undertaken permit design refinements for obtaining more sophisticated measurements for future missions.

User requirements

User Requirements for Photographic Imagery was the title of the paper presented by Lt. Col. Henry F. Hauser, USAEPG; CS & AD. He stressed the need to consult with the final user of equipment during research and development stages, since it is the photo interpreter who, in the final analysis, will have to extract data produced by the system in use. Pointing out the need for better human engineering slanted toward the photo interpreter, Col. Hauser quoted one of the best Air Force image interpreters (Maj. Byron Schatzley): "We put into the air a reconnaissance aircraft costing a million dollars and into the plane we put a twenty thousand dollar camera, spend hundreds of dollars on film, processing and printing, then give the photo interpreter a seven dollar stereoscope to perform his job." Col. Hauser pointed out that there is a trend in the Army toward smaller format sizes, due to higher resolutions, and better processing techniques.

Air-to-ground

Dr. William M. Young, USAEPG, CS & AD followed with his paper: *Aspects of Transmission of Photographic Imagery From Air to Ground* in which he reviewed the photoscat system. This is used to take reconnaissance pictures in the air, process the film immediately, transmit the scanned image to ground stations where it is re-recorded, processed and viewed within two minutes. Although the images received by this method by the ground station have a resolution of about 10 lines/mm, this system is useful for immediate command decisions, whereas the airborne film, of higher quality, is used for later analysis. Dr. Young gave requirements of photostat equipment to include the capability of operating at altitudes from 500-55,000 ft. and at speeds from 90 knots to mach 2. The airborne camera employs 70mm film in 50 or 100-ft. loads and uses either 1½, 3, 6 or 12-in. lenses. Automatic exposure control and frame rates of 3 fps for day use and 1 fps for night use with flares. Airborne processing, done via Saran wrap, will also preserve film until recovery. The scanner converts the image into electric signals for transmission by means of a light beam approximately 0.0003 in. square, capable of handling a contrast ratio of 100:1. The transmitter has a range of 300 miles, line-of-sight. Dr. Young showed slides indicating the progress to date in photoscat equipment.

Reconnaissance

The session on Reconnaissance Systems as presented by Col. A. L. Wallace, Chief, Aerial Recon. Lab., Wright Air Dev. Ctr, ARDC, was classified as secret but the following brief synopsis was cleared for publication.

Recent progress in reconnaissance systems has been made along the lines of 1) systems for in-flight processing of photo records, televising the image to land stations; 2) improving the resolution of aerial photographs from 25 lines/mm to approx. 10 lines/mm since World War II. Col. Wallace mentioned that it is now perfectly possible to see a fishing pole from an altitude of 15,000 ft.; 3) emulsion speeds increased so that pictures can be taken by moon or star light with the equivalent of e.i. 5,000; 4) progress in use of integrated multiple sensor reconnaissance systems, employing radar, photography and infra-red recording.

Col. Wallace listed problems on which further development is required: 1) rapid means of integration of radar, photo and IR images in flight within a few seconds; 2) improvement in IR windows and cells with greater IR sensitivity, not requiring cooling; 3) an all-weather substitute for high altitude photography; 4) better ways to speed interpretation of reconnaissance records; 5) overcoming film processing equipment difficulties such as dirt, nonuniform processing, edge fog, etc.; 6) methods for further improvement in resolution; 7) high resolution for long focus lenses for better image definition from satellite altitudes; 8) ways

to transmit large area detailed photos from space vehicles with reduced bend widths; and 9) (time and again) the demand for "re-usable film."

Automatic exposure control

Automation and Exposure Control Systems was the subject of Dr. Frank Back, Zoomar, Inc. He pointed out that as far back as 1935, automated systems of exposure control were in existence. He then went on to expound his theory that all such systems should operate through the taking lens, rather than by a photocell which does not view through the lens. Dr. Back then explained the Zoomar Trulex system, which uses a beam splitter within the lens and employs two counter-rotating variable step density wedges.

Long range tracking

Problems of long range tracking photography was the subject of Dr. Raymond Kardas, RCA, Patrick AFB. He described methods used for missile photography at Cape Canaveral, Fla. The system includes a series of tracking stations at distances from 5-400 miles from the Cape Station location is determined by elaborate measurement of sky brightness distribution for optimum results in long range photography. Basic equipment is IGOR system, developed by J. W. Fecker, and ROTI system, developed by Perkin-Elmer. Systems employ 18 and 24-in. apertures and focal lengths from 90-500 in. Format is generally 2¼ x 2¼ with exposures of 1/80 or faster to prevent smear. Negative materials are black-and-white and color. Best results are achieved on black-and-white film with missile painted white. Experiments have been made painting missile with fluorescent colors and photographing through color filters. Dr. Kardas went into considerable detail describing best attitude (more or less vertical, against bright blue sky) for long distance photography and showed graphs of the sun's position for various times of day at Cape Canaveral. He explained that with present day equipment f/10 is most desirable from the standpoint of resolution. Greater apertures do not affect sharpness but only increase exposure speed. Dr. Kardas also stressed the need for a stable platform elevated above earth's atmospheric disturbance, but he does not expect to see such a system for a considerable time to come.

Next a panel consisting of Dr. K. Pestrokov, Nortronics, W. Davis, Itek Corp. and Walter Wallin and K.

(*continued on page 74*)

for the hard-to-please

• Sound • Editorial • Laboratory Services

Capital

CAPITAL FILM LABORATORIES, INC. • 1905 FAIRVIEW AVENUE, N. E.
WASHINGTON 2, D. C. • PHONE LAWRENCE 6-4634
Get more information. Circle 419, page 81

GUARANTEED UNBREAKABLE!
COLUMBIAN STAMPING & ENAMELING CO., Inc. • Terre Haute, Ind.
Get more information. Circle 422, page 81

Color Film Strips
fast and economically

. . . from 35mm slides, transparencies or crtwork. Also black and white filmstrips.

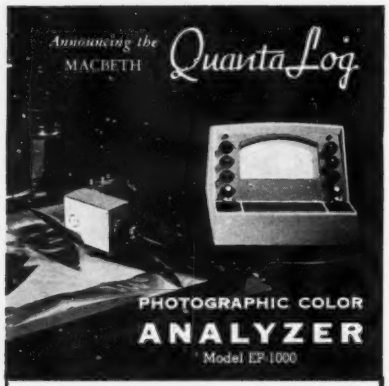
•

Fast service on 35mm color duplicate slides.

•

DuKane audio-visual equipment.

COLIND PHOTOGRAPHY
713 Main St. Peoria, Ill.
Get more information. Circle 421, page 81



Electronic

COLOR BALANCE EXPOSURE CONTROL

that REALLY works!

The Model EP-1000 is the finest "on-easel" control instrument commercially available at a cost considerably under $1000.

With it you can:

- Avoid costly test prints and remakes.
- Produce quality Color prints with good color balance and exposure, whether one copy or in quantity, in 3 easy steps.
- Accurately stop down enlarger lens to repeat your exposures.
- Easily operate instrument without having to be an engineer.

For "off-easel" Color Negative Evaluation the accessory Model ET-20 transmission attachment is available.

Macbeth instruments do not cost—they pay. We invite you to write us c/o Dept. A to receive a 4-page brochure which will completely describe the features, advantages and cost of the Model EP-1000. If you wish to see one of these instruments, let us know and we will send you the name of the nearest authorized Macbeth instrument dealer.

MACBETH INSTRUMENT CORPORATION

P.O. BOX 950 NEWBURGH, N. Y.

*Trade Mark of the Macbeth Corporation

Get more information. Circle 464, page 81

TERMINI
film editorial service inc.

FILM EDITING

MATCHING

INDUSTRIAL • THEATRICAL • TV

16mm • 35mm • Color • B&W

MUSIC & EFFECTS SELECTION

FILM CONSULTANTS EXPEDITING

245 WEST 55th ST. NEW YORK 19, N.Y.

JUdson 2-7873

Get more information. Circle 496, page 81

MUSIC FOR FILM AND FILMSTRIPS

- editing of complete musical background scores from our extensive music-on-film library
- also new Hi-Fi Disc Library available. *Write for* catalogue PM

corelli-jacobs film music, inc.

723—7th Ave., N. Y. 19, N. Y. Phone: JU 6-6673

Get more information. Circle 424, page 81

INSTRUMENTATION

(*continued from page* 73)

Sandefur of Hycon Co. explored The Realities of Photographic Image Formation. Discussion started with Maxwell criteria which can only be met partially in practice, images being affected adversely by aberration, spherical coma, astigmatism, field curvature and distortion. The first four affect image quality and the last its shape. Even upon elimination of all aberrations, performance of an optical system will still be affected by diffraction which limits resolution and contrast obtainable.

Image quality was discussed in connection with the common method of evaluation by means of resolution targets of various shapes. A new method is the use of sinusoidal targets to facilitate evaluation of optical performance. For system performance data, information on fine detail reproduction, contrast reproduction and distortion correction is required. Certain compromises in optical image formation must be accepted such as a choice of high resolution and low contrast. In aerial photography, lower resolution and higher contrast are at times preferable. General tendency in lens design was described as aiming for a capability of f/4 with a resolution of 400 lines/mm which, in fact, is an adopted design at present.

What is needed now are better emulsions, since the 400 lines/mm will be reduced to 200 lines/mm with presently available films. It was pointed out also that lens design by its very nature is slow, since there are no simple means to determine effects of single elements on the performance of an optical system. Lens design still depends greatly on extended trials of component combinations.

Nuclear testing

The subject of Photographic Instrumentation of Nuclear Testing Programs was presented by Dr. Lewis Fussell of Edgerton, Germeshausen & Grier. He explained the work of his company in providing accurate timing signals for nuclear tests and in scientific photography of such tests involving unmanned cameras. He talked about the wide range of size, time and light output of the objects to be photographed. Size of objects ranges from a tiny rivet head to size of gigantic fireball, a ratio of 100 million to one. The range of exposures is on the order of 10 billion to one, while timing involves speeds from .1 microsecond to several hours (10^9 to 1). Dr. Fussell explained that light levels and exposure times must be predicted accurately, which can be done on the basis of past experience. Some of the data recorded is growth of the size of the fireball, which gives information on the total released energy, recording of the speed of rise of the fireball.

Underwater photography

The work shop session Underwater Photographic Instrumentation Problems was classified confidential. It dealt with instrumentation problems of the Polaris, Operation Pop-Up and Operation Sky Hook. The shortcomings of various instrumentation methods (optical, electro and acoustical) were discussed in greater detail and problems of a manned research vessel operating to a depth of 35,000 ft. came under scrutiny (*see PMI, August, 1959*). Low contrast under water presently seems to limit photographic slant ranges to 75 ft. There was also mention of high-speed motion pictures obtained at a depth of 230 ft. without artificial light at 1000 fps. An interesting sidelight was the unsolved problem of keeping fish out of optical scenes during underwater instrumentation photography. Investigations are underway to produce methods of discouraging fish.

High-speed work

Advanced High Speed Motion Picture Techniques employed a panel consisting of users and suppliers. This inter-related panel gave two different aspects on similar problems. The users' panel consisted of Morton Sultanoff, BRL, Aberdeen Proving Ground, Steve Colletti, McDonnell Aircraft and William Griffin, USN-OTS, China Lake. The vendors panel contained James Chadwick, Chadwick-Helmuth, Inc., John H. Wadell, John Kiel, Photo-Sonics, Inc., Robert Shoberg, Beckman & Whitley, Inc.

First Mr. Chadwick described the principles of Slip-Sync techniques for vibration and slow motion visualization *(see PMI, Sept. 1958)*. John H. Wadell and John Kiel both spoke on the subject of rotating prism cameras, admitting that intermittent movement cameras still produce a higher quality image but can by no means match rotating prism types for speed of frame rates. They saw no great breakthrough in design changes of rotary prism cameras for the future and felt that most improvements will be made in the area of accessories. The only camera improvements forseen for the immediate future might lie in the area of selection of glass refraction indexes and thickness and in the number of prism faces. Mr. Shoberg commented on the necessarily short writing time of high-

speed rotating prism instruments, which necessitates accurate timing between camera and event.

After this, the users had their say. Mr. Griffin explained that most of the high-speed work at NOTS is on missile penetration and on detonation studies. One of the cameras used is an 8mm Fastax operated at higher than design voltage to obtain 20,000 fps. Griffin mentioned that a drum-type camera running at full speed in standby condition waiting for the event would be of great value. Mr. Colletti talked about camera installations aboard aircraft, especially the F-101. Some are camera installations in the wings to record missile separation. Colletti pointed out that in several cases, results from cameras mounted in the airstream are superior than from many streamlined pod installations. He also stressed reliability of equipment and referred to one camera program which started with 25 per cent reliability but was boosted by in-plant improvements to 97 per cent. Mr. Sultanoff covered ultra high-speed operations, in excess of one million fps and shutter speeds less than one microsecond. These speeds are achieved by rotating mirror-type cameras, employing a reimaging plate. He also commented on Russian designs employing the same principle. He indicated that the Russians have actually taken the basic principle and gone further with it than we have in the U.S.A. The Russians are achieving higher frame rates and longer film writing times, according to the speaker.

In summary it seemed from this session that the vendors panel requested users' acceptance of some of the limits to gain better quality results, indicating that equipment cannot be universal and deliver maximum quality results in all regions of use. The user panel showed interest in higher frame rates, larger film sizes, better result quality and higher accuracy.

Specialized emulsions

During the panel "Applications of Specialized Emulsions in Photographic Instrumentation" the film manufacturers had their say. Mr. Raife Tarkington, Eastman Kodak Co., Mr. W. R. Holm, Du Pont, and Mr. Waldo Hunter III, Ansco, were on this panel. Mr. Tarkington reviewed latent image formation and referred to sensitivity limits around 1 x 10^4 meter-candle-seconds, with a gamma range available from .5 to 7.5. He mentioned a new response measurement of emulsions by means of sine wave frequency response analy-

(*continued on page 76*)

16MM HIGH-SPEED CAMERAS with PROVED PERFORMANCE

In the AIR... in SPACE... on the GROUND... under WATER... wherever SHOCK, HIGH G's, or VIBRATION are present

A size for every application

100' capacity 200' capacity 400' capacity

FRAME RATES
- CINE: 4 to 400 f.p.s.
- PULSE: Up to 6 f.p.s.

FILM TRANSPORT
- Intermittent with registration pin
- "Turbine-smooth" action

PICTURE QUALITY
- Highest resolution over entire format
- No jump or side weave

D·B·Milliken Co. 131 No. Fifth Avenue, Arcadia, California

During constant use, misuse, and abuse, Milliken cameras deliver proved performance

Get more information. Circle 469, page 81

LEARN THE MANY ADVANTAGES THAT ARE YOURS WITH HINELIGHT... LOWER COST... LESS TIME... FINEST DETAIL IN PHOTOGRAPHY OF COMPLEX TECHNOLOGICAL PRODUCTS—AND MORE.

HINELIGHT PAYS IN RESULTS—IN DOLLARS. WHY CONTINUE DOING IT THE SLOW, HOT, HARD, UNPREDICTABLE AND EXPENSIVE WAY? LET HINELIGHT WORK FOR YOU. BROCHURE WILL HELP YOU SEE THE LIGHT. SEND FOR IT. HINELIGHT CORPORATION

Get more information. Circle 445, page 81

Industrial dealers are specialists who have the knowledge, merchandise, and the desire to serve you. Before you buy, consult the PMI DIRECTORY of INDUSTRIAL DEALERS on page 61 for the expert "man-who" nearest you.

JF FILM SERVICE

Your Complete Editing Service

TV Films Industrial Films
Commercials Feature Films

Convince Yourself . . . Give us a call.

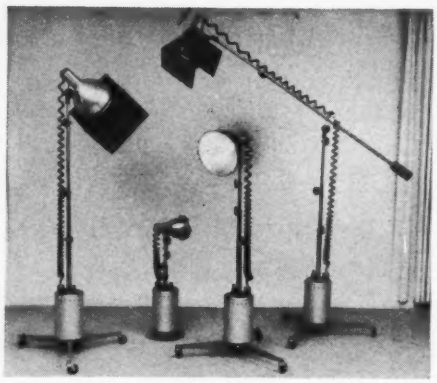
45 West 45 St., N.Y.C. CI 6-6804

Get more information. Circle 454, page 81

the GOLDEN Starliter 400 HAS EVERYTHING

☆ 5-power selector switch. (25,50,100,200 and 400 ws)
☆ Longer flash.
☆ Short re-cycling.
☆ Low voltage.
☆ Lightweight rugged construction.
☆ Studio tested.
☆ Daylight color temperature.
☆ Versatility with style.

AUTOMATIC VOLTAGE STABILIZATION FULL 400 WS POWER



Starliter gives you twice as much power and voltage control as competitive sets for only a slight difference in price.

Four Lamp Set Only $161.3 Complete As Shown

SCHEIBE ENGINEERING, INC.
Write to
Box 208, Burlington, Wis.

Get more information. Circle 489, page 81

DARKROOM SINKS

TOPS IN SERVICE TOPS IN VALUE

Every darkroom needs one for efficient operation. These heavy duty sinks are made of warp-resistant marine plywood . . . 67" long, 26" wide, 8" deep, 40" high. Varnished, caulked and waterproofed for many years of useful service. Sink is mounted on heavy-duty tubular steel legs, and has brass fittings with a ½" pipe thread, ready for attachment of a drain hose or standard fitting. Price includes full length shelf below sink for storage. ORIGINAL COST WAS $161.25!

A MUST FOR EVERY DARKROOM

WRITE FOR NEW GIANT CATALOG

HOLLYWOOD CAMERA CO.

NOW ONLY **39.85** F.O.B. N. Hollywood

10611 Chandler Blvd., No. Hollywood, Calif. All equipt. from former gov't. stock.

Get more information. Circle 446, page 81

QUANTITY PHOTOS

8 x 10's as low as 7½c. Postcards as low as 2½c. Write for samples and complete price list on all sizes and quantities.

AS LOW AS **7½¢**

KIER PHOTO SERVICE
Dept. PM-1220 W. 6 St., Cleveland 13, Ohio

Get more information. Circle 455, page 81

music!

to score your films by
COMPOSED AND RECORDED WITH *YOUR* NEEDS IN MIND
WRITE TO
BOOSEY & HAWKES, INC.
30 WEST 57TH STREET
NEW YORK 19, N. Y.
FOR CATALOG AND INFORMATION

Get more information. Circle 411, page 81

INSTRUMENTATION

(*continued from page 75*)

sis. Mr. Holm stated that some of the new requirements being placed on film manufacturers were: low contrast conditions due to haze in long distance recording, special high-speed processing requirements, which include high temperature resistance (past 120° F) and a better method of film speed determination since ASA film speeds are not applicable in this work, only small portion of film curve (toe, straight line or shoulder) being actually used. Needed: a way to measure speed and response in region actually used.

The question period was interesting with members of the audience—at the request of the panel—stating their idea of "dream film." This material should be a color film of highest resolution and highest speed, and/or film insensitive to any radiation (gamma, etc.) but highly sensitive to visible spectrum of light. It should have a base material which is non-hydroscopic and finally, again, came the overall dream of "reusable film." On the latter subject, the requirement was that it should be possible to create images through filters without processing. It should be possible to erase these images by exposure through other filters in order to use the same film again and again. That this is not as far-fetched as it seems was implied by a remark that work along the lines indicated is actually in progress in at least one lab in this country.

Instrumentation

"Instrumentation—Optical, Yes or No?" was the title of a presentation by Glen Sanderson of Lockheed. He emphasized the great need for knowledge of optics and photography coupled with knowledge in the field in which experiments are conducted. Also, there must be a mutual exchange between the experimenter and the instrumentation agency, since the records obtained by photo instrumentation are in essence a form of report. He gave the first public demonstration of Lockheed's take-off and landing recording photographic installation, where mirrors provide side views of the runway and a center section of the film shows the runway below the aircraft. Divergence and convergence of the side views are used to establish the plane's altitude and elevation. The system is simpler and more flexible than theodolite recording or electronic trajectory set-ups.

Unconventional Optics was the

(*continued on page 93*)

FREE LITERATURE

For your copy of any free literature item, circle the appropriate number on the reader's service card, attached, page 81.

AUDIO-VISUAL

Projection Story **201**
Strong Electric Corp. 4-page brochure describes Strong carbon arc lamp slide projectors for projection in lighted rooms.

Automatic Slide Display **202**
Spindler & Sauppe. Specification sheet for Selectrovision Model 440 Display cabinet which changes slides automatically and has provision for twin hi-fi speakers and sound equipment.

Slide File Cabinet **203**
Multiplex Display Fixture Co. 16-page catalog of steel file cabinets for 4 x 3¼, 2 x 2 and microscopic slides.

Moving Coil Microphones **249**
Camera Equipment Co., Inc. Specification sheet for D-36 and D-45 moving coil microphones with selector unit.

CAMERA & LENS

Film Bibliography **250**
Victor Animatograph Corp. Bibliography "Where to Get Films and Film Information" lists directories, magazines and periodicals.

Darkroom Camera **203**
W. A. Brown Mfg. Co. 4-page folder describes the Commodore line of darkroom cameras. Includes specifications and space requirements.

Monocular View Finders **204**
Photo Research Corp. 8-page booklet describes Spectra monocular view finders and focusers for newsreel and tracking cameras. Includes charts of lens fields.

Radarscope/Oscilloscopes **205**
Scopus Brockway. Catalog sheet for Canon Photo-Radarscope units and Photo-Oscilloscope units for recording transient phenomena on the face of radar and oscilloscope screens.

Duplex Microfilm Camera **206**
Diebold Inc. Illustrated specification sheet describes operation features of Flofilm 14-in. Duplex camera designed to microfilm copy up to 14-in. wide on 16 or 35mm film.

Process Camera **207**
Jos. Gelb Co. 4-page descriptive folder gives specifications and features of Gelb Process all metal cameras available in three sizes.

Petri-Penta **208**
Petri Camera Co., Inc. 4-page folder describes the Petri-Penta 35mm camera. Includes prices.

Lens Selector **209**
Traid Corp. 4-page folder includes list of 57 lenses for 16 and 35mm cameras offered for sale or for rent by this California corporation.

Photomicrographs **210**
Eastman Kodak Co. 12-page pamphlet describes methods of photomicrography in color and black-and-white. Includes a bibliography of reference books and articles. Also a table of suitable Kodak films and plates.

SELECTROVISION is SELECTROSLIDE

READY FOR ACTION — ANYWHERE

Combines Sight and Sound for Scientific Selling

The very versatile SELECTROSLIDE automatic slide-projector "Merit Award Winner" at the Brussels Worlds Fair NOW housed in attractive, self-contained, mobile folding cabinet gives

DESIGNERS OF DISPLAYS and EXHIBITORS
exactly what they need and want.

Shown is SELECTROSLIDE projector with 3" lens, 16" x 24" plastic non-reflecting screen, in cabinet with washable brown and tan fabric covering entire cabinet area, (folds down to 9" x 56" x 30").

Provision is made for sound (Twin HI-FI speakers). Tape recorder may be housed in cabinet base below SELECTROVISION. The unit is available with back (if displayed in center of room) providing filtered ventilation, ducted exhaust system.

Without cabinet-base or table SELECTROVISION is ideal for Reception Room or store window. Standing on table (as shown) or cabinet-base (to house tape recorder) brings unit to eye-level. SELECTROVISION is most useful for Convention Halls and In-store Exhibits.

OUR ENGINEERING DEPARTMENT IS EAGER TO ASSIST IN WORKING OUT TECHNICAL DETAILS FOR SPECIAL APPLICATIONS OR CUSTOM INSTALLATIONS.

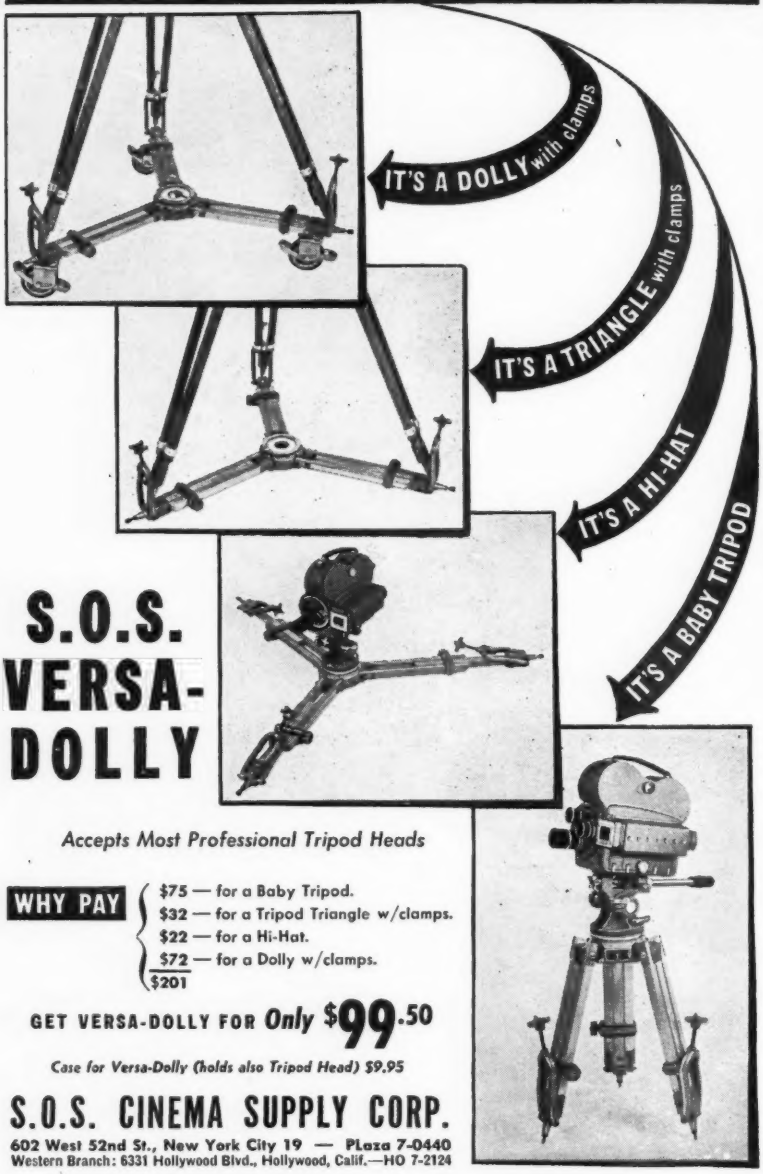
Write for complete information and literature.

spindler & sauppe
Established 1924

2201 Beverly Boulevard
Los Angeles 57, California
Phone: DUnkirk 9-1288

Get more information. Circle 494, page 81

The MULTI-PURPOSE Production Tool



S.O.S. VERSA-DOLLY

Accepts Most Professional Tripod Heads

WHY PAY

$75 — for a Baby Tripod.
$32 — for a Tripod Triangle w/clamps.
$22 — for a Hi-Hat.
$72 — for a Dolly w/clamps.
$201

GET VERSA-DOLLY FOR *Only* $99.50

Case for Versa-Dolly (holds also Tripod Head) $9.95

S.O.S. CINEMA SUPPLY CORP.

602 West 52nd St., New York City 19 — PLaza 7-0440
Western Branch: 6331 Hollywood Blvd., Hollywood, Calif.—HO 7-2124

VISIT S.O.S. BOOTH 23 at S-M-P-T-E CONVENTION
Statler Hilton Hotel, N.Y.C. Oct. 5 to 9
Get more information. Circle 492, page 81

VIDEO **FILM LABORATORIES**
Established 1949

Specializing . . .
In 16mm Film developing and printing
Super Anscochrome Force developed to A.S.A. 400

- **16MM ANSCOCHROME**
- **16MM B&W REVERSAL**
- **16MM B&W NEGATIVE**
- **16MM B&W POSITIVE**

350 West 50th Street
New York 19, N. Y.

Get more information. Circle 499, page 81

Make your films professional with "Major" Production Aids!

The Finest Complete Library of Recorded Industrial Background for Your Films.

INDUSTRIAL MUSIC · TITLE MUSIC · BRIDGE MUSIC
SOUND EFFECTS · OPENINGS & CLOSINGS

All High Fidelity Recordings With Excellent Definition

SEND FOR FREE CATALOGUE

THOMAS J. VALENTINO, INC. Dept. PMI
150 West 46th St., New York 36, N. Y.

Get more information. Circle 498, page 81

GRAPHIC ARTS

Sensitized Materials **222**
Frederick Post Co. 12-page folder describes sensitized papers, cloths and films plus processing chemicals.

Whiteprinting Machine **223**
C. F. Pease Co. Brochure describes Pease General automatic whiteprinting machines and their operation.

Reproduction Machines **224**
Frederick Post Co. 8-page illustrated folder gives specifications of Post fully automatic, semi-automatic and manually operated whiteprint machines.

Phototypesetting Machine **225**
Amsterdam Continental. Illustrated brochure includes specifications of Hadego typesetting machine.

Kodalith Ortho Plate **226**
Eastman Kodak Co. 4-page data supplement for Kodalith Ortho Plate, Type 3, for making line and halftone negatives and positives.

Cleaner-Transparentizer **227**
Hampton Processes, Inc. 4-page CTS bulletin describes the CTS transparentizer and cleaner method now available in aerosol containers.

EQUIPMENT

Color Analyzer **211**
Macbeth Instrument Corp. 4-page folder explains operation of the Quanta-Log color analyzer, Model EP-100, as a color printing aid.

Densichron Catalog **212**
W. M. Welch Scientific Co. 20-page catalog of Densichron photometers and densitometers and accessories.

Studio Strobelights **213**
Scheibe Engineering Inc. Illustrated price list for Starlighter Traveler 5-lamp portable lighting outfit.

Projection Printer **214**
Advance Photo Equipment Inc. 4-page illustrated price list for Metro projection printers.

70mm Processor **216**
Photostat Corp. Specification sheet for Statfile spiral film processor for 70mm film.

Microfilm Reader **217**
The Filmsort Co. 4-page folder gives specifications of the 18 x 24-in. microfilm reader for enginering drawings.

Graded Grid Light 215
Hinelight Corp. 4-page folder gives specifications of the radially graded annular grid light for producing high information photographs with "maximum recorded detail".

Nega-Files 218
Nega-File Co. 24-page illustrated catalog of wooden files for negatives slides, slide magazines, movie film and filter frames, etc. Includes prices.

Oxberry Unistand 219
Camera Equipment Co., Inc. 4-page folder describes the Oxberry Unistand for cameras and enlargers. Includes prices and a list of accessories.

Burke & James Catalog 220
Burke & James, Inc. 132-page catalog of photographic items from cable releases to cameras. This is the 62nd annual catalog offered by this Chicago company.

Speed Ez-el 221
A. J. Ganz Co. 4-page illustrated folder gives sizes and prices of metal enlarging easels.

MOTION PICTURES

Animation Stand 228
Florman & Babb. Illustrated folder describes features of Triplex animation, titlestand and product stage for film makers. Includes prices.

Background Music 229
Corelli–Jacobs Film Music. 30-page catalog lists high fidelity disc and tape recordings of background music for film and slide presentations.

Film Edge Numbering 230
S.O.S. Cinema Supply Corp. 4-page folder describes MOY visible edge numbering machine and reprint from *American Cinematographer,* "Visible Edge Numbering of Film Aid to Editing."

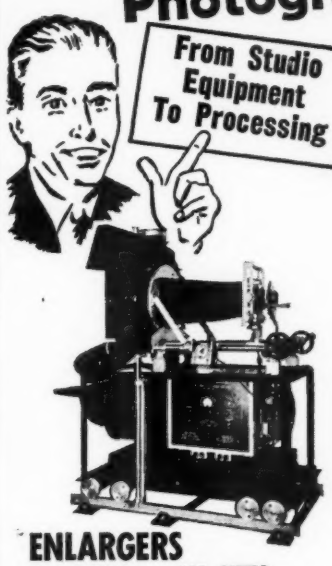
MPE Price List 231
Motion Picture Enterprises, Inc. 4-page pice list of motion picture supplies. Includes reels, cans, fiber cases, projection lamps, etc.

Recording Equipment 234
Rangertone, Inc. 8-page catalog and price list describes operation and specifications of Rangertone Cynchronous recording equipment.

Comprehensive Catalog 235
Comprehensive Service Corp. 38-page catalog of motion picture equipment and supplies.

The Solution To Your Photographic Problems At Your Finger Tips . . .

From Studio Equipment To Processing



ENLARGERS
ALL TYPES . . . ALL SIZES

Designed to keep abreast of latest technical developments and produced by master craftsmen, Caesar-Saltzman Enlargers embody all the most advanced features. Models and sizes to meet every requirement.

CAMERA STANDS
STUDIO . . . PORTABLE

Sturdy stands that hold cameras motionless in any position. Controls for raising, tilting and swinging are all convenient. Changes in position can be made as quickly as they can be thought of.

ASCOR SPEEDLIGHTS

Models range from small light weight portables to high power sunlights. Light weight, A.C. or battery operated, single or multiple lights. Building Block Design makes equipment easily handled even for large installations. Power can vary from 800 to 40,000 watt-seconds with as many light sources as needed.

STAINLESS STEEL PRODUCTS

Sinks, Mixing Tanks, Temperature Controls. Any stainless steel specialties built to your requirements.

Write for Complete Information

Headquarters for Professional Photographic Equipment Since 1920

CPS **J. G. SALTZMAN, INC.** CPS

SALES DISTRIBUTORS for CAESAR MANUFACTURING, INC.

480 Lexington Avenue, New York 17, N. Y.

Get more information. Circle 488, page 81

Information Bulletins **232**
W. A. Palmer Films. Series of technical information bulletins outlining procedures and specifications for "sound recording narration, work print for effects, preparation of 16mm printing leaders," etc. plus price of services offered by this San Francisco firm.

Versa-Dolly **233**
S.O.S. Cinema Supply Corp. Illustrated price list for multi-purpose Versa-Dolly which may be used as a hi-hat, baby tripod, dolly and tripod triangle.

SERVICES

Camera Rentals **236**
Tech-Camera Rentals, Inc. 4-page brochure contains daily and weekly rates for photographic equipment rentals from this California firm.

Equipment Rentals **237**
Birns & Sawyer Cine Equipment Co. 32-page rental catalog of photographic equipment offered for rent by this Hollywood firm.

Visual Aids **238**
Admaster Prints Inc. 16-page booklet of practical specifications for visual aids includes prices for services offered by this New York company: Copy prints, display transparencies, photo lettering, slides, overlays, animation etc.

Color Lab **239**
Hauser Color Lab. Price list for color prints and film developing services offered by this Milwaukee company.

Quantity Prints **240**
Zepp Photo Service. Price list for glossy prints in sizes from post card to 8 x 10 and quantities of 25 to 5,000.

Lighting Rentals **241**
Charles Ross Inc. 4-page rental rates for lighting, grip equipment, generators and props for motion picture and television studios offered by this New York firm.

Motion Picture Lab **242**
Byron, Inc. 8-page price list offered by this Washington, D.C. firm includes color and black-and-white processing services plus editing and sound work for 16 and 35mm film sizes.

16mm Services **243**
Capital Film Laboratories, Inc. 8-page price list includes editorial and sound services as well as film processing offered by this Washington, D.C. company.

Rental Price List **244**
Gordon Enterprises. 20-page price list of cameras, lenses, magazines and other photographic equipment offered for rent by this N. Hollywood firm.

SUPPLIES

Price Card **245**
Kurshan & Lang Custom Color Laboratories, Inc. Accordion folded price card fits in standard 3 x 5-in. file.

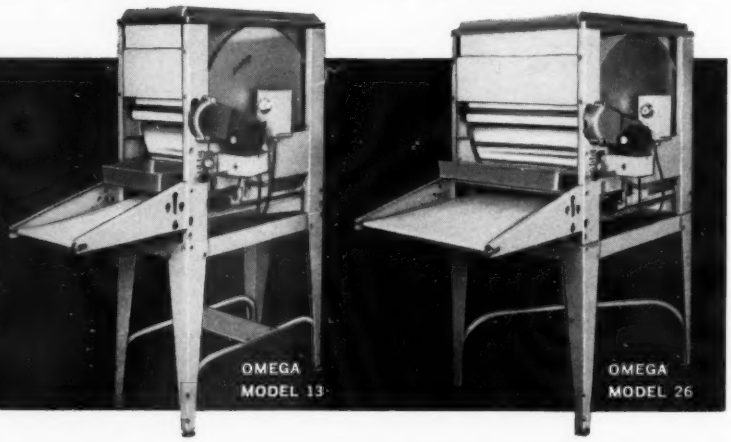
Photocopy Materials **246**
Peerless Photo Products, Inc. 8-page booklet presents the complete range of Peerless photocopy emulsions and base stocks. Charts give specifications and most suitable applications.

Cronapaque Print Film **247**
Du Pont Photo Products. Illustrated brochure includes sample of Du Pont's polyester base Cronapaque Print Film.

High-Speed Ektachrome **248**
Eastman Kodak Co. 4-page data pamphlet for High-Speed Ektachrome film with an e.i. of 160 daylight. Punched to fit Kodak reference notebook. Includes flood and flash exposure charts and electronic flash guide numbers.

FROM AMERICA'S GREATEST MAKER OF PRECISION PHOTOGRAPHIC EQUIPMENT...AMERICA'S GREATEST DRYER VALUES

Two GREAT omega DRYERS
FOR PHOTOGRAPHERS AND PHOTOFINISHERS



SIMMON Omega
Manufactured by
PAKO CORP.
Minneapolis, Minn.

- Thermostat Heat Control.
- Dries B/W glossy and matte, single or double weight material up to 12 inches wide.
- Seamless Superdrum for uninterrupted drying.

Handles print drying volume with consistent high quality. The seamless Superdrum assures uninterrupted drying. Continuous even heat. Adjustable apron speed.

- Thermostat Heat Control.
- Dries B/W glossy or matte, single or double weight.
- Dries Color Material (with AS-2557 Stainless Steel Drum).
- Full 24 inch wide evenly heated drying surface.

Adds speed to print drying plus improved quality to prints. Accessories available for strip drying. Adjusts to various print materials. Efficient, low cost drying.

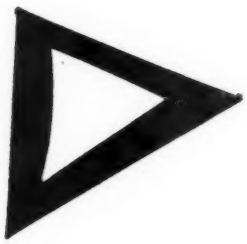
Write today for complete literature to:
Simmon Brothers, Inc. Dept. PM-9
30-28 Starr Avenue
Long Island City, N. Y.
Name_____
Address_____
City_____ Zone____
State_____
826

Available only through specially franchised Simmon industrial product dealers.

Get more information. Circle 490, page 81

Use this handy subscription order to receive your own copy of PMI every month.

YOURS FOR THE ASKING



More information on

- **New Products**
- **Catalogs—literature**
- **Advertisements**

Quick, complete

USE THESE CARDS

1. Note Key Number listed below each advertisement and with new product and free literature items.

2. Circle the number on the Readers' Service Card.

3. Fill in your name and address and mail the card. NO STAMP REQUIRED.

NEW SUBSCRIPTION ORDER

Please enter my subscription to PMI-PHOTO METHODS FOR INDUSTRY for the term checked at left:

☐ 1 year $4.00

☐ 2 years $7.00

☐ 3 years $10.00

☐ Payment enclosed

☐ Bill me later

☐ Bill company

NAME ..... Please Print

TITLE .....

COMPANY NAME .....

ADDRESS ☐ Business ☐ Home .....

CITY ..... ZONE ..... STATE .....

CC

FIRST CLASS
Permit No. 43763
New York City, N. Y.

BUSINESS REPLY CARD

No Postage necessary if mailed in the United States

Postage will be paid by

PHOTO METHODS FOR INDUSTRY

33 WEST 60TH ST.

NEW YORK 23, NEW YORK

READERS' SERVICE DEPT.

NEW PRODUCTS & SERVICES

101 102 103 104 105 106 107 108 109 110 111 112 113
114 115 116 117 118 119 120 121 122 123 124 125 126
127 128 129 130 131 132 133 134 135 136 137 138 139
140 141 142 143 144 145 146 147 148 149 150 151 152
153 154 155 156 157 158 159 160 161 162 163 164 165

FREE LITERATURE

201 202 203 204 205 206 207 208 209 210 211 212 213
214 215 216 217 218 219 220 221 222 223 224 225 226
227 228 229 230 231 232 233 234 235 236 237 238 239
240 241 242 243 244 245 246 247 248 249 250 251 252
253 254 255 256 257 258 259 260 261 262 263 264 265

ADVERTISEMENTS

401 402 403 404 405 406 407 408 409 410 411 412 413
414 415 416 417 418 419 420 421 422 423 424 425 426
427 428 429 430 431 432 433 434 435 436 437 438 439
440 441 442 443 444 445 446 447 448 449 450 451 452
453 454 455 456 457 458 459 460 461 462 463 464 465
466 467 468 469 470 471 472 473 474 475 476 477 478
479 480 481 482 483 484 485 486 487 488 489 490 491
492 493 494 495 496 497 498 499 500 501 502 503 504
505 506 507 508 509 510 511 512 513 514 515 516 517
518 519 520 521 522 523 524 525 526 527 528 529 530

PMI CC

Send Information Items Circled

GOOD FOR ONLY 90 DAYS

NAME ..... please print

POSITION .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE .....

STATE .....

FIRST CLASS
Permit No. 43763
New York City, N. Y.

BUSINESS REPLY CARD

No Postage necessary if mailed in the United States

Postage will be paid by

PHOTO METHODS FOR INDUSTRY

33 WEST 60TH ST.

NEW YORK 23, NEW YORK

CIRCULATION DEPT.

NEW PRODUCTS & SERVICES

101 102 103 104 105 106 107 108 109 110 111 112 113
114 115 116 117 118 119 120 121 122 123 124 125 126
127 128 129 130 131 132 133 134 135 136 137 138 139
140 141 142 143 144 145 146 147 148 149 150 151 152
153 154 155 156 157 158 159 160 161 162 163 164 165

FREE LITERATURE

201 202 203 204 205 206 207 208 209 210 211 212 213
214 215 216 217 218 219 220 221 222 223 224 225 226
227 228 229 230 231 232 233 234 235 236 237 238 239
240 241 242 243 244 245 246 247 248 249 250 251 252
253 254 255 256 257 258 259 260 261 262 263 264 265

ADVERTISEMENTS

401 402 403 404 405 406 407 408 409 410 411 412 413
414 415 416 417 418 419 420 421 422 423 424 425 426
427 428 429 430 431 432 433 434 435 436 437 438 439
440 441 442 443 444 445 446 447 448 449 450 451 452
453 454 455 456 457 458 459 460 461 462 463 464 465
466 467 468 469 470 471 472 473 474 475 476 477 478
479 480 481 482 483 484 485 486 487 488 489 490 491
492 493 494 495 496 497 498 499 500 501 502 503 504
505 506 507 508 509 510 511 512 513 514 515 516 517
518 519 520 521 522 523 524 525 526 527 528 529 530

PMI CC

Send Information Items Circled
GOOD FOR ONLY 90 DAYS

NAME .....
please print

POSITION .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE.....

STATE .....

FIRST CLASS
Permit No. 43763
New York City, N. Y.

BUSINESS REPLY CARD

No Postage necessary if mailed in the United States

Postage will be paid by

PHOTO METHODS FOR INDUSTRY

33 WEST 60TH ST.

NEW YORK 23, NEW YORK

READERS' SERVICE DEPT.

Use this handy subscription order to receive your own copy of PMI every month.

YOURS FOR THE ASKING

More information on

- **New Products**
- **Catalogs—literature**
- **Advertisements**

Quick, complete

USE THESE CARDS

1. Note Key Number listed below each advertisement and with new product and free literature items.

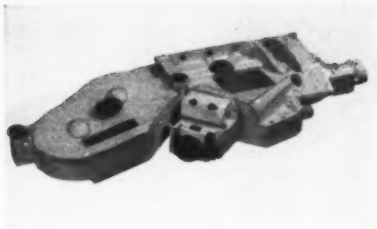
2. Circle the number on the Readers' Service Card.

3. Fill in your name and address and mail the card. NO STAMP REQUIRED.

Supe
A M
signe
Mod
been
Engi
Th
run
super
parer
separ
Orgi
grou
trast,
can
Th
as
syste
on t
be n
horiz
with
part
may
angle
it po

NEW PRODUCTS

For additional information on any new product circle the appropriate number on the readers service card, page 81.



Superimposing Titler 106

A Model 1539 titler, especially designed to work in conjunction with our Model 1506 Still Reflex camera, has been announced by Frank Hermfeld Engineering Corp.

The titler eliminates the necessity to run film through the camera twice to superimpose a title onto a transparency. It also makes unnecessary a separate exposure test for the title. Orginal and title are viewed in the ground glass at the same time. Contrast, visibility and color for the title can be adjusted visually.

The manufacturer describes the unit as follows: "the lamp, condensing system, title and relay lens are fixed on their optical axis. All of this may be moved in unison either vertically, horizontally or along its optical axis with sufficient latitude to cover any part of a 2 x 2-in. slide. Also, the title may be rotated through a full 360° angle. The relay lens is used to make it possible to use the same size title with originals ranging in size from 2 x 2 to 8 x 10 in. The mirror used is anti-reflection coated and has a total insertion loss of less than two per cent."

High-Speed 70mm Camera 107

The 70mm-10B rotary prism camera which operates up to 360 fps and provides 2¼ x 2¼ pictures has been announced by the Traid Corp. The camera is said to be ideal for seat ejection tests missile launching and tracking and high-resolution streak photography.

Strike Camera 103

The first of a series of special wide-frame strike cameras for fire control evaluation on the Convair F-106 delta-wing jet interceptor has been delivered by the Benson-Lehner Corp.

The camera is a 35mm, 400-ft. unit with a 1 x 3-in. format and a 6-in. lens. It is equipped with correlation systems, timing lamps and fiducial marks. Left and right hand versions are designed to fit into the cambered leading edges of the Convair plane so that their angles of view overlap slightly.

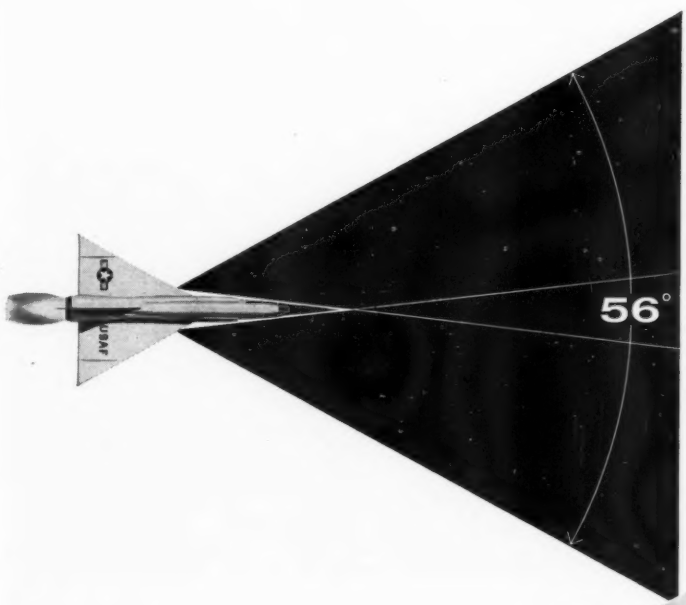
The two cameras make a simultaneous record during the fire control period and give a combined panoramic view of about 52°. The manufacturer states that with the system it is possible to have both a missile and target in camera view from launch to strike even though ranges may be from 10,000 to 20,000 ft.

Manual Portronic Camera 101

A manual version of the Beattie Portronic camera has been announced by Beattie-Coleman, Inc.

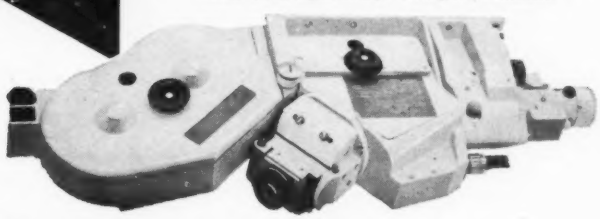
The camera incorporates many of the features of the standard Beattie Portronic camera. However the 70mm roll film which is contained in a 100-ft. capacity magazine is advanced manually. This permits it to be used where electricity

(*continued on page 84*)



NOW THE CONVAIR F106-B CAN SEE OUT OF THE CORNERS OF ITS EYES. Left and right hand versions of the new Benson-Lehner Strike Camera, using 6-inch lenses, give a combined field of view of 56 degrees in evaluating the aircraft's fire control system. The cameras have a 1" x 3" format, equivalent to 4 standard 35mm frames, and are capable of cine operation at 10 and 20 fps. If you need wide angle telephoto coverage, the Benson-Lehner Strike Camera can be packaged to meet your requirements. The chances are that we can come up with the answers to other sticky photo-instrumentation problems, too. Just write the Photo-Instruments Division of Benson-Lehner.

benson-lehner *corporation*
11930 W. Olympic Blvd., Los Angeles, California



Get more information. Circle 406, page 81

is not available and for studio use where completely automatic operation is not essential.

The lens in the Beattie Manual Portronic is a Wollensak 162 mm f/6.3 to f/32. Viewfinder has matching lens and full size ground glass focusing. Automatic parallax correction is provided. Picture frame size is 2½ x 3¾ in. Negative identification is provided by batteries. Shutter is a Wollensak Alphax with built-in flash synchronization. Adjustable to 1/25, 1/50, 1/100, T and B.

300mm Lens for Robot **109**

A Tele-Xenar 300mm f/5.6 telephoto lens is available for Robot 35mm cameras through Karl Heitz, Inc. The lens can be used with either the Robot Recorder models or the Robot Royal. A special telescopic accessory finder with 5X magnification allows viewing and focusing of distant subjects. Price: $199.

"Hi-Pro" Accessories **119**

Barn doors, a heavy-duty swivel bracket and a heavy-duty, collapsible light stand have been developed by Hershey Manufacturing Co. for use with the "Sun-Lite Hi-Pro" electronic flash units.

The barn doors rotate through 360° for controlling light. Price: $9.95.

The bracket is designed to take any ⅝-in. stud from tripod or light stand while its own ⅜-in. stud will fit the "Hi-Pro" and other units. A ¼-in. adapter is included. Price: $4.95. The price of the light stand is $19.95.

High-Intensity Flashbulb **113**

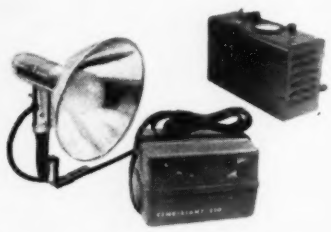
The FloodFlash FF-33, a high-intensity flashbulb designed for use with high-speed motion pictures has been announced by Sylvania Electric Products, Inc. The average flash duration of the lamp is said to be 1.75 sec. and a single FloodFlash will exposure some 37 ft. of motion picture film at 1,000 fps or 75 ft. at 2,000 fps. At slower camera speeds several lamps may be flashed in sequence at 1.75 sec.

Hypo Silver Reclaimer **110**

Silver recovery of 7.8 oz. troy, per 1,000 ft. of film is claimed by Manning-Webb Electric, manufacturers of the Hypo Silver Reclaimer, Model MWB 20, which is self-circulating and operates continuously. The metal anodes and anti-Polarization power unit achieves "100 per cent capacity" while processing is going on, it is said. When used as a recirculation system the displacement is 180 gal. per hour, and the reclaiming tank holds 27 gal. of the solutions at a time. The unit operates on house current. Price: $2,400.

Cine-Light **111**

A full 20 min. of lighting time before battery recharging is claimed for the Cine-Light Model 250B by the manufacturers, Dormitzer Electric & Mfg. Co., Inc. Features include a separate transistor controlled high rate battery charger. The charger, it is said, will recharge the batteries in four hours after each use. The battery pack weighs 14 lbs. and is 6 x 7½ x 5 in.



The light head attaches to most motion picture cameras and the reflector is adjustable from flood to spot and is 9 in. in diameter. Price of the Cine-Light Model 250B is $350; the type S-36-114, 250-watt bulb is $2.50. All prices f.o.b. Cambridge, Mass.

(*More new product news items continued on page* 86)

FILMLINE ANNOUNCES

WORLD'S FASTEST COMMERCIAL PROCESSOR

FOR REVERSAL & NEGATIVE/POSITIVE 16MM FILM

- New impingement-type film Dryer
- Temperature control
- Rinse tank with spraybar after each chemical tank
- Eight film squeegees
- New low-pressure type air squeegee
- Overflows and bottom drains
- Tachometer
- Solution and drybox thermometers
- Oil-less, rotary air compressor with pressure gauge
- Recirculation pumps and spraybars
- Stainless steel, type 316, tanks
- Daylight operation
- 1,200 Film Magazine
- Variable Speeds/Development Times

Wherever quality results are demanded in the fastest processing time . . . or wherever illumination is inadequate for quality image density . . . this newest, fastest combination 16MM Reversal and Negative/Positive film processor . . . the Filmline Model RT-S will consistently provide the solutions to these processing problems.

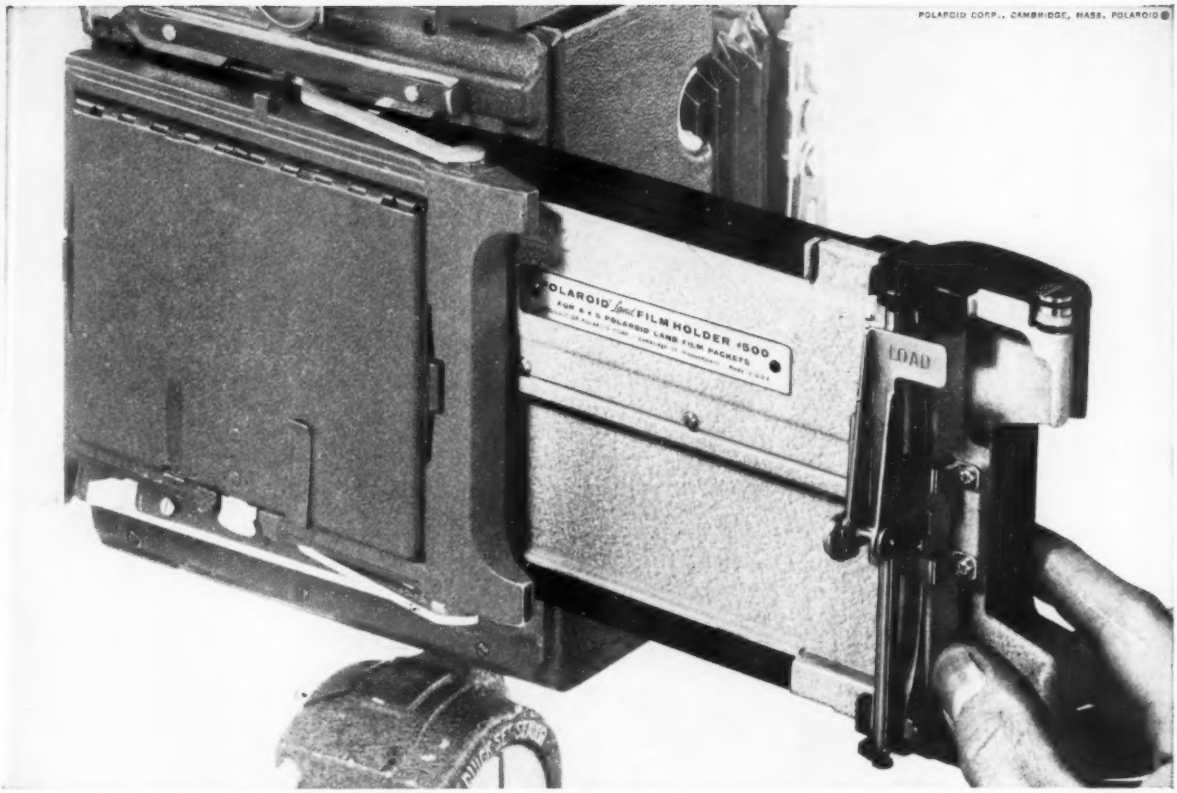
For in-plant, high-speed photography . . . for television stations, racetracks, and motion-picture film labs . . . the Filmline Model RT-S *is the ideal machine* . . . providing quality results at speeds to 125 ft./minute . . . and permitting increases of the ASA index 1000% on DuPont or Eastman Reversal Emulsions.

Fully equipped, ready for immediate operation the Model RT-S offers you high cost film processing features for the low price of only $6,450.00.

Filmline

FILMLINE CORPORATION, DEPT. PS-59 MILFORD, CONN.

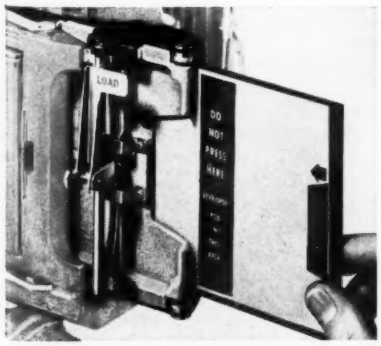
Get more information. Circle 408, page 81



(1) This new Polaroid Land film holder is interchangeable with your regular film holders. Slide it in and you're ready to produce a finished full-size 4 x 5 picture of professional quality in 60 seconds. There's no change in film plane; no readjustment of rangefinder or ground glass. The holder remains in the camera as you shoot picture after picture without delay. A new specially designed 4 x 5 film packet contains negative, positive sheet and developing pod . . . all the elements necessary for a 60-second picture.

NEW POLAROID® LAND 4X5 FILM-HOLDER

Instantly adapts your 4 x 5 camera for 60-second pictures!



(2) Slip in this new Polaroid Land film packet, pull back protective envelope and take your picture. Flip down lever and pull film packet out to process picture.

(3) Picture processes itself inside its packet, *outside the camera.* In 1 minute, pull packet apart and see the finished picture. If desired, development can be postponed.

(4) The pictures are of exceptional quality, made with either of two new Polaroid Land films. The film holder costs $49.95. The packets, $6.22 and $7.31 per box of 12.

Get more information. Circle 506, page 81

INDUSTRIAL

The 3rd Annual **film & AUDIO-VISUAL** SEPT. 28-OCT. 1st

EXHIBITION

NEW YORK CITY

TRADE SHOW BUILDING—500 Eighth Avenue

Presented by

INDUSTRIAL EXHIBITIONS, Inc. 17 East 45th St., New York City

NEGA-FILE #4500

for 4 x 5 prints and negatives

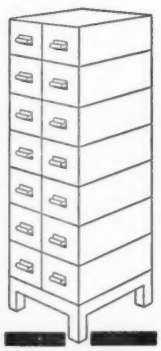
Large capacity hardwood chest has two drawers — holds 1500-4 x 5 negatives, prints or cards. Includes 1500 printed envelopes or transparent sleeves, index cards and visible numbered guides. Stack one upon another for compact, yet ample storage.

#4500 Chest with printed envelopes and cards **$49.95**

#4500A Chest with transparent sleeves and cards **$92.95**

#BA-4600 Base — fits either chest **$6.45**

Sold at Dealers everywhere! Write for new NEGA-FILE Catalog!



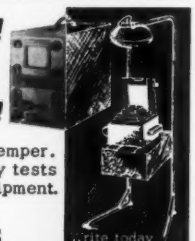
DIMENSIONS: 14¼ x 15¼ x 6½

• NEGA-FILE COMPANY • DOYLESTOWN • PA. •

Get more information. Circle 476, page 81

FOR SALE!

FAILURE INSURANCE!



Save your time and temper. Make quick and easy tests on all your photo equipment. Use a

ServiShops Motion Analyzer

Write today for complete free information

NATIONAL CAMERA REPAIR SCHOOL

Room MI(8) Englewood, Colorado

Get more information. Circle 474, page 81

GET IN THE ACT YOURSELF

Ever try to take your own picture with a self-timer? Then you know the problems. You can easily solve them by using a DeGroff AIRWAY SHUTTER RELEASE . . . because you become master of your camera and can choose the exact moment you wish to shoot. Trips shutter at any distance from 5 in. to 50 ft. or more.

See your dealer or write *Fully guaranteed*

DeGroff Laboratories, Inc.
1920 South Michigan
South Bend, Indiana

Get more information. Circle 425, page 81

NEW PRODUCTS

(*continued from page* 84)

Slide-Sound Display Cabinet 102

A folding display cabinet that incorporates a rear-projection screen for slide display in room light and "twin hi-fi" speakers is the Model 440 Selectrovision, made by Spindler & Sauppe.

Folded down, the unit measures 28½ x 10 x 56 in. Set up, the unit presents a 24 x 16-in. "non-reflective, fine grain plastic rear projection screen" to an audience. A system of two front surface mirrors automatically locates itself as the cabinet is unfolded to reflect the slide images from a projector to the screen. In one variation, a tape recorder is concealed in the base of the unit. Another possibility is the use of the cabinet, without the base, for slide display on conference tables. In this case the audio equipment is housed separately. The unit is finished in brown and tan simulated leatherette.

Sinar Filter Holder 104

Said to permit the use of but one set of filters for all formats of the Sinar View Camera the Sinar Universal filter holder is fastened to the front frame of the camera by a metal stud. It can be swung in and out of position while exchanging lensboards or adjusting the lens of the 8 x 10, 5 x 7, 4 x 5, 2¼ x 3¼ and 2¼ square interchangeable camera.

The holder accepts the 103 diameter coated Sinar filters. Adapters for series VIII and IX filters are available. Price of the holder: $29.90.

Amplifier-Speaker Combo 105

The Model MR-1A transistorized power amplifier-speaker combination has been announced by Hallen Electronics. The 12-watt amplifier is completely transistorized and is said to be acoustically flat and free from dips and peaks in frequency response for 40 to 12,000 cps. Volume and equalization controls are provided on a recessed panel and a jack is installed for an external speaker. The unit is designed for use with most tape recorders and similar signal sources.

Cloth Intermediate 115

A black line cloth intermediate, the 101 CZB Blue Tint Ozacloth, said to have increased covering power has been introduced by the Ozalid Division of General Analine and Film Corp.

The Ozacloth has a double matte surface which will accept pencil, ink or typewriter. The blue tint of the Ozacloth is said to reduce glare and furnish maximum contrast for reading. Standard drafting pencils or plastic drawing pencils can be used. Corrections can be made with an eraser.

The manufacturer assures complete development at standard printing speeds and claims that since it is black line material it will show no "pinking" of the background on development or aging. It is said the new plastic surface will not soften or stick during printing, developing or a reprinting operation and it is not affected by the slow printing speeds of poor masters.

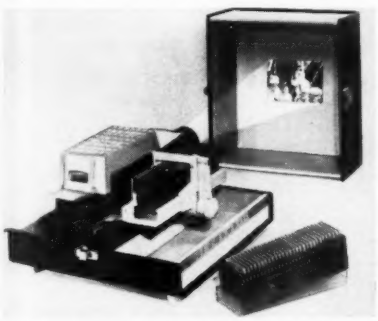
Super Hy-Ortho **116**

Super Hy-Ortho, a high-speed orthochromatic sheet film with moderate grain characteristics, has been announced by Ansco. Its daylight rating is 100, tungsten 50 when rated accord- to the American Standards method. Ansco tests indicate that for optimum results the user should set his exposure meter for daylight 250 and tungsten 125.

Prices are: $2.20 for 25 2¼ x 3¼ sheets; $3 for 25 3¼ x 4¼ sheets; $3.95 for 25 4 x 5 sheets; $6.25 for 25 5 x 7 sheets; $23.75 for 100 5 x 7 sheets; $13.10 for 25 8 x 10 sheets; $10.20 for 10 11 x 14 sheets.

Slide Projector **108**

The Headliner 710, 500-watt semi-automatic slide projector, announced by Bell & Howell features an illuminated editing panel at the back of the projector housing for previewing slides before you load them into trays for projection. It also has a 10½ x 11½ pro-



jection screen built into the case cover. The lens is a 4-in. f/3.5 Trionar and projects 2 x 2, bantam and super slides.

The Headliner 710 is constructed of die-cast aluminum with a black-and-white crinkle finish. When closed it measures 7 x 11 x 12 in.

Diazo Papers **117**

A semi-moist diazo paper, Onyx 5, said to provide high quality dense line images at machine speeds up to twice as fast as with comparable papers has been introduced by Keuffel & Esser Co.

Another new paper, Onyx 8, is approximately 40 per cent faster than the general purpose Onyx 5. It is designed to reproduce at extra fast speeds.

(*continued on page* 88)

Motion pictures and television in the

SPACE AGE

86th SMPTE Convention
Statler Hilton, New York
October 5-9, 1959

Technical Sessions

MONDAY, Oct. 5	Cinematography Laboratory Problems, including Symposium on Film Steadiness Sound Recording and Reproduction
TUESDAY, Oct. 6	Space Technology and Image Sensing (2 sessions)
WEDNESDAY, Oct. 7	Equipment Papers and Demonstrations by Exhibitors
THURSDAY, Oct. 8	Television Equipment and Practices (2 sessions)
FRIDAY, Oct. 9	High-Speed Photography International Television Television: Scientific and Military Uses Television Recording, including Video Tape

EXHIBIT

Professional motion-picture and television equipment for data instrumentation and other space age uses, as well as the latest products designed for general industry purposes, will be displayed at the Statler Hilton. The following companies will be among those participating:

Animation Equipment Corp.
Arriflex Corp of America
Bausch & Lomb Optical Co.
Bell & Howell Co.
Camera Equipment Co.
Camera Mart, Inc.
Canadian Applied Research Ltd.
Century Lighting, Inc.
Cine Speed, Inc.
Electronic Systems, Inc.
Florman & Babb, Inc.
Karl Heitz, Inc.
Hollywood Film Co.
Houston Fearless Corp.
JM Developments, Inc.
Macbeth Instrument Corp.
National Cine Equipment, Inc.
Neumade Products Corp.
Precision Laboratories
Prestoseal Mfg. Corp.
RCA Film Recording
Rapid Film Technique, Inc.
Ro-Nan Plastic & Mfg. Co.
S.O.S. Cinema Supply Corp.
Time Automated Mfg. Co.
Vicom, Inc.

Society of Motion Picture and Television Engineers
55 WEST 42nd STREET, NEW YORK 36 • LOngacre 5-0172

THE REVOLUTIONARY
NEW
INSTANT
FILM
PROCESSOR

- See what you shoot Instantly
- Will fit most 16mm Motion Picture Cameras
- Approx. wt. only 15 lbs.
- Economically Priced—Eliminates Labs
- FOR Television and Motion Picture Industry
  Sports Events Kinescoping
  Microfilming Industrial Films

Write for additional Information

Cine Speed, inc.
Pioneer 6-6000
ROOSEVELT RACEWAY, WESTBURY, N.Y.

Get more information. Circle 418, page 81

WESTERN
Cine
DENVER

FOR FASTEST
PROCESSING

16mm, BLACK & WHITE
and ANSCOCHROME

Western Cine offers you fastest service and finest quality processing! Our 16mm Motion Picture Laboratory is completely equipped to handle all your production and filming needs with satisfaction guaranteed.

- PHOTOGRAPHY
- SOUND RECORDING
- PRINTING
- TITLING and ANIMATION
- PROFESSIONAL EQUIPMENT (sale and rental)

Write for Producer's Net Price List

WESTERN Cine SERVICE, Inc.
114 E. 8th Ave.
Denver, Colo., Ph. AM 6-3061

Get more information. Circle 502, page 81

Ruling Repeater **112**

For use on Gelb line-up and register table, an automatic gear set repeater is said to enable a stripper to repeat rulings and scribings to pre-determined dimensions within 1/1000 in.

It is intended for scribings on negative film for tabular and ruled forms, graphs and grids or wherever repeated rulings are required.

The device incorporates three vernier dials calibrated in 1/64, 1/72 and 1/100 in. They are coupled to three corresponding gears. The operator sets the appropriate vernier dial to the desired stroke distance. This distance is governed by the corresponding gear. Maximum stroke travel is ½-in.

Wide-Angle Lens **118**

Arri-mounted Angenieux 18.5mm f/2.2 wide-angle lenses are now available from Gordon Enterprises. The mounting enables the lens to be used on Arriflex 35 series cameras.

The 7-element, 63° angle of coverage lens is said to provide extreme depth of field and be virtually distortion free.

Mixing Cylinders **114**

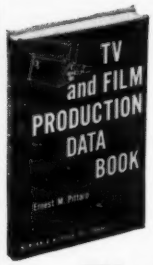
A series of new graduated mixing cylinders made from unbreakable polypropylene has been added to the line of The Nalge Co. Special stoppers have been designed so that the graduates may be used for almost any mixing purpose. The octagonal base is said to provide stability and prevent rolling.

The cylinders are available in six sizes: 25, 50, 100, 250, 500 and 1,000 milliliters with subdivisions graduated in 1, 2, 5, 10, 20 and 25 ml. respectively. All dimensions are in accordance with Federal specifications for glass. The manufacturer guarantees accuracy to within one per cent.

For more information regarding any new products item, circle the appropriate number on the Readers' Service Card, page 81.

Plus-X Pan

Kodak Plus-X is now available in 120 and 620 roll film sizes. Officially called Kodak Plus-X Pan Professional Film it is described by the manufacturer as incorporating the same emulsion characteristics as 35mm Plus-X Improved Type introduced last year. The new film will be sold only in packages of 25 rolls. ASA exposure index of the film is 80 daylight, 64 tungsten, although "the film can be exposed at two times these indexes for best results in many instances." Price of the 25 roll package: $15.



Key to Profitable Production in Television Video Tape and Film

TV and FILM
Production Data Book
Ernest M. Pittaro

Save time and money with this practical new working reference for television, video tape and film production. Instant answers to thousands of questions asked daily by planning, supervisory and production staffs. Instructions, data, tables, illustrations covering: television studio & mobile units, video tape, kinescope, TV commercial standards, sound, lighting, motion picture cameras & equipment, films, exposure, filters, hi-speed and time-lapse films, animation, etc. 128 tables include equipment, World TV station & set data, depth of field, hyperfocal distance, field of view, shutter speeds, projection, time conversion, footage-frame-time comparisons, and much more!

ORDER NOW! TV and Film Production Data Book, 448 pages, 198,000 words, 132 photos, 128 tables, 4½ x 7-inch page size fits pocket, sturdy library binding, dust jacket $6.95

Ask for FREE literature on "How To Shoot A Movie Story," "Photographic Lens Manual & Directory," "Business Founding Date Directory" and photo book catalog of important work aids.

MORGAN & MORGAN, Inc., Publishers
101 Park Ave., New York 17, N. Y.

Get more information. Circle 472, page 81

How GOOD is GOOD?

REVERSAL PROCESS IS THE MEANS TO BEST RESULTS . . .

- REVERSAL DEVELOPING
- NEGATIVE DEVELOPING
- DUPE NEGATIVES
- REVERSAL PRINTS
- REVERSAL PRINTS COLOR TO B&W
- POSITIVE PRINTS
- A & B and SOUND PRINTING

KIN-O-LUX Inc.
17 WEST 45th STREET
NEW YORK 36, N. Y.
JUdson 6-1880

Get more information. Circle 456, page 81

YOUR BEST SOURCE FOR QUALITY COLOR PROCESSING AND PRINTING

KM KURT MAYER COLOR LABS., INC.
49 West 27th St., New York 1, N.Y.

Get more information. Circle 465, page 81

SUGGESTION MOVIES

(*continued from page 58*)

Actual shooting time for a 30-minute film is about seven days and includes four different plant locations. The suggestion department at each plant is notified of his forthcoming arrival and they compile a list of successful ideas for Fred to consider for his movie. Once ten examples are picked, the supervisor in charge of the specific area or operation is notified and Denz moves in his meager assortment of equipment—camera, tripod and light bars. Currently he uses Kodachrome exclusively although the first two films were shot in black-and-white. The lamp bars are arranged in a semi-circular position with the subject at the center. Such an arrangement gives sufficient modeling and fill-in to be pleasing. He works fast in order not to disrupt the production schedule, shooting about three times as much footage as is used in the final product. He finds it much better to cover the suggestion completely the first time. Extra footage can be edited later while reshooting is costly, time consuming and generally upsets the production schedule at the plants.

How are the final products used and have they worked? Denz still tours the country for his regular meetings with plant supervisors but he tries to time his arrival to coincide with a monthly dinner meeting at which time the home-method movies serve as the highlight of the evening. The actual examples of successful ideas which appear in the film serve to bring home the fact that employee ideas on better ways of doing things are practical and effective and warmly welcomed by management. Furthermore, the utter simplicity of some of the ideas invokes the "I can do it better than that" attitude which stimulates action.

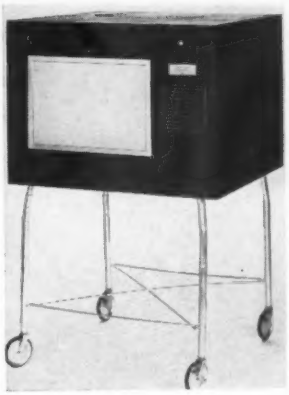
Denz's plan has been so successful and the demand for his films so great that he now has to have a dupe print made for shipment to Remington Rand locations in England. He is considering the possibility of recording the narration optically. This would facilitate more widespread showings of his films, since the present ones require a magnetic sound projector which is less common than the optical sound projectors.

Denz may think of himself as a backyard photographer, but there's no arguing with success. Many a pro could envy his putting films to work.—THE END.

SELLING THE COMPANY IMAGE—

The highlight of a recent dealer meeting held by Kellogg Switchboard and Supply Company was a film on the company image. The film was conveniently shown with a Triangle Continuous Projector TV Table Model.

TRIANGLE CONTINUOUS PROJECTOR TV TABLE MODEL



Your audience need only press the button. This brings them an intimate viewing of your company story or sales message. Daylight translucent screen assures perfect viewing.

Assembly includes Triangle Continuous Instrument, using 30 ball bearings—insures proven performance. Modified Bell & Howell Filmosound Projector. Single cycle or continuous operation. Volume Control. 8" speakers. Plastic woodgrain finish. Tubular legs, heavy duty castors. Film running time 12 to 45 minutes.

For full information on Triangle Continuous Projector for use in selling your company image, write:

TRIANGLE PROJECTORS, INC.

3706 Oakton, Skokie, Illinois

Get more information. Circle 497, page 81

". . . MORE than a manual. Throughout the book the how-to-do-it information is profuse . . . down to the last detail." —SMPTE JOURNAL

16mm SOUND MOTION PICTURES

by WILLIAM H. OFFENHAUSER, Jr.

A definitive and comprehensive guide to 16mm technology essential to the professional and the newcomer. Practical and concise, generously illustrated, it follows the 16mm movie from its inception through processing, editing, sound recording, projection, and final use in industry, TV and other areas—every phase covered in detail.

592 pages, illustrated $12.50

Contents include—16mm • Relation to other sizes • Making the picture • Characteristics • Making originals • Dimensions and Standards • Emulsion position problems • Equipment and Cinematography • Sound recording, characteristics and equipment • Editing and assembly • Storage • Processing and release printing • Projection • Duplicating tri-pack color films • Industrial applications • Television and film • Appendices and index.

from your bookseller or

INTERSCIENCE PUBLISHERS, INC.

250 Fifth Avenue, New York 1, N.Y.

Get more information. Circle 450, page 81

Automatic Daylight Processing

DEVELOPING TANK

- Processes up to 400 Ft.
- 8mm-16mm-35mm-70mm
- Movie—X-Ray—Microfilm
- Motor driven portable
- Tough plastic tanks
- Uniform Density Assured

FILM DRYER

- Motor driven—Heated
- Speedy drying
- Automatic shrinkage allowance
- Stainless steel and aluminum construction
- Easily assembled without tools
- Compact, Portable

Guaranteed. Write for Free Literature

MICRO RECORD CORP 487-10 South Ave. Beacon, N. Y.

Get more information. Circle 468, page 81

LENZ *Hi-Speed* ROTARY WASHERS

"BY FAR THE BEST"

GUARANTEED TO WASH PRINTS TWICE AS FAST AT HALF THE COST

Write and get the facts

LENZ WASHER CO. (Since 1919) P. O. Box 70 Lebanon, Missouri

Get more information. Circle 462, page 81

VARIABLE SHUTTERS and automatic Dissolve Attachments for ALL BOLEX "H" Cameras

The real answer to fades and dissolves

Also Dual Power Viewer For Bolex Reflex.

PELLEGRINI-PIEK

1545 Lombard St. • San Francisco 23, Cal

Get more information. Circle 481, page 81

MAGNETIC STRIPING

16mm 8mm

FREDERICK F. WATSON, INC.

202 E. 44th St., N.Y. 17, N.Y. • MU 2-7280

Get more information. Circle 501, page 81

accura

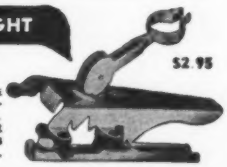
Focusing Extension Tubes for 35mm, Exakta, Praktiflex, Pentacon, etc. **$9.95**

ACCURA INDUSTRIES, P.O. Box 54, Flushing, N.Y.

Get more information. Circle 482, page 81

HOLD THAT LIGHT

with GATOR GRIP Clamp-Stand



$2.95

Rugged Professional-type Light Holder, clamps securely to most any object. Stands squarely on flat surface. Swivel directs light as desired. . . . Other features.

WHITMORE PRODUCTS, Box 302 Pompton Lakes, N.J.

Get more information. Circle 503, page 81

LABCRAFT
FOR 16MM
BLACK & WHITE
REVERSAL
PROCESSING

Labcraft is fully equipped, expertly staffed to handle all your 16 MM Reversal and Negative-Positive processing in Black and White. Labcraft also offers duplicate 16 MM Color and B&W printing, editing and sound recording. Film sold with processing included. The number to call is . . .

UTAH 1-4334

LABCRAFT
INTERNATIONAL CORPORATION

4019 PROSPECT AVENUE
CLEVELAND 3, OHIO

Get more information. Circle 458, page 81

Standard of the Film Industry for 40 Years

From the Keystone cops to the TV Spectacular, film makers have learned to depend on GB reels. Precision constructed of heavy gauge U. S. steel, in the famous brown finish. Finest you can buy . . . Available in 400' to 2,300' sizes, other sizes made of hard aluminum up to 5,000 feet on application.

sold thru authorized dealers only

GOLDBERG BROS.
DENVER, COLORADO

Get more information. Circle 436, page 81

F.Y.I.

(*continued from page* 8)

nations that whatever play we might accidentally indulge in was only to keep us from getting dull always fell on rather unsympathetic ears. Anyway, Photostat Corporation wants to open a branch in Hawaii and they figured that, although it is a center of commerce and industry, there are certain recreational and cultural attractions which might make it seem a desirable place in which to study the market for Photostat's products. So to be fair, the assignment will go to the branch manager who shows the best sales volume increase. And to be fair, he can take his wife, with all expenses for two paid by Photostat. This "togetherness" stuff goes too far. . . .

This rocky road

The road to Yong Dong Po, home of the *Thursday Shopper* is getting heavily traveled with erring editors joining the staff in droves. The latest goof involved electronic flash units, with one error of commission and one of omission. The error committed put Scheibe Engineering, manufacturers of the Starliter units in Burlington, Vermont instead of Burlington, Wisconsin. They are in Wisconsin and will stay in Wisconsin. Our apologies.

The error of the second part consisted in omitting from our chart Beattie-Coleman, 1000 N. Olive Street, Anaheim, Calif. For those who prefer their charts complete, here is a rundown on Beattie-Coleman units:

Model No. 50, 1000 ECPS, 50-watt-seconds, Kodachrome Guide No. 30. Flash duration 1/1000 second; Color temperature 6300° K, beam coverage 45°. Uses AC, with 5-sec. recycling time. Price is $94.50.

Model No. 100, 1450 ECPS, 100-watt-seconds (50 on half power). Color temperature 6300°. Flash duration 1/1000 sec. Beam coverage 50°, recycling time 10 sec., full power and 8 sec., half power. Uses AC. Accessories include stand, modeling light, barn doors, slave units, etc. Price is $134.80.

Model No. 200, 2600 ECPS, 200-watt-seconds full power, 100 half power. Flash duration 1/500 sec. Color temperature, 6300°. Beam coverage, 50°. Recycling time, full power, is 10 sec., half power, 8 sec. Accessories similar to Model No. 100 above. Price, $177.30.

Once more, apologies to all concerned, and to our no-goodnik editor, keep shoveling that coal—it's cold in Yong Dong Po.—THE END

Use FilMagic All Ways!

—FilMagic Cloths Hand-Clean Films, Records.
—FilMagic Tapes For Film Cleaning Machines.
—FilMagic Pylon Kits For Tape Recorders.
—FilMagic Pylon Kits for 16MM SOF PROJECTORS.
—Gest Best Results With FilMagic Silicones!

MANUFACTURED & GUARANTEED BY
THE DISTRIBUTOR'S GROUP, INC.
204 FOURTEENTH STREET, N.W.
ATLANTA 13, GEORGIA

Get more information. Circle 426, page 81

THE FILM DOCTORS®
SPECIALISTS
in the science of
FILM
REJUVENATION

RAPIDWELD Process for:
• Scratch-Removal
• Abrasions • Dirt • "Rain"

Send for Free Brochure

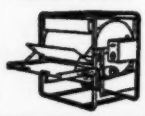
rapid FILM TECHNIQUE INC.
37-02 27 St., Long Island City 1, N. Y.

Get more information. Circle 486, page 81

MASKOID LIQUID FRISKETS
the liquid mask-out medium for airbrush re-Touching on prints, films and transparencies.
Removes by Peeling — Folder Available
Andrew Jeri Company, Inc.
1281 McDonald Ave. • Brooklyn, N. Y.

Get more information. Circle 452, page 81

Super Polished SEAMLESS CYLINDER
MODEL A. G. GLOSSY DRYER
CAPACITY 150 8x10 S W PER HOUR
APRON WIDTH 22 in.



JOHNKE MANUFACTURING COMPANY

Get more information. Circle 453, page 81

ELWOOD PHOTRIC-TIMER
"TOPS FOR DARKROOM EFFICIENCY"
Automatic Exposure Control
Assures uniform print quality
Eliminates Test Printing
Saves time and paper
MODEL 400—$127 MODEL 1200—$330
FOTOMATIC 2603 KESSLER BLVD. INDIANAPOLIS 22, IND.

Get more information. Circle 434, page 81

LEARN TO EARN IN INDUSTRIAL PHOTOGRAPHY
Good positions at excellent starting salaries await the well-trained photographer. Industrial photography covers all fields—commercial, color, motion picture and pictorial. The complete training received at Brooks Institute assures your success at the start of your career. GI approved.
• Write today for illustrated booklet and complete resident course information.
BROOKS INSTITUTE OF PHOTOGRAPHY
2190 Alston Road, Dept. 14
Santa Barbara, California
"Where the mountains meet the sea"

Get more information. Circle 412, page 81

It's easier to deal with firms
who understand your problems
See PMI's Directory of Industrial
Dealers on Page 61

Specialized

LIGHTING EQUIPMENT

for

MOTION PICTURE, STILL

and

TELEVISION STUDIOS

Write for Your Copy of Our
1959 Catalog G Just Published

Mole-Richardson Co.

937 NORTH SYCAMORE AVENUE
HOLLYWOOD 38, CALIF.

Get more information. Circle 471, page 81

FOR TV, FILM AND TAPE

Screen Writing and Production Techniques

by Charles W. Curran

This new, non-technical handbook gives all the basic facts of production for filmed, taped and live TV programs, motion pictures and TV commercials. Includes full information on *video tape*, formulas for TV and movie script writing, complete glossary of terms. Actual up-to-date costs are shown for all phases of production. Profusely illustrated with charts, diagrams, photos. Indexed for easy reference.

Only $4.95 from

Hastings House, Publishers

151 E. 50th St., New York 22

Get more information. Circle 441, page 81

MICROREPRODUCTION

(*continued from page* 18)

veloped to cut roll film into appropriate lengths and insert these into jackets. Machines also exist to cut and insert images into single cards. The simplest form of jacket is not unlike a cut film negative envelope except that it is made of transparent acetate. Widths are available for 16, 35 or 70mm or any combination of different widths. Jackets may be of almost any desired dimensions with the rows running horizontally or vertically. In some cases paper card stock is incorporated in the design so that filing information can be added. Some jacket cards can be punched for mechanical sorting.

A favorite insert card used by the writer is standard library card size, 3 x 5 in., with a single sleeve for 35mm microfilm. The sleeve will accommodate up to 12 pages of text. The upper half of card stock is used for typewritten or handwritten notes and indexing information. The file of complete texts of articles fits in well with note cards and similar related reference items.

Reading machines

Reading machines of great variety are available for use with unitized material. A great convenience and advantage is the fact that the entire card can be placed in the machine and the film read directly without removing it from the protective envelope. A second advantage is the ease of making additions to a file; another bit of film is simply slipped into the jacket. A potential disadvantage is the difficulty of making prints or enlargements by continuous methods from unitized files. Single or a few frames are no trouble. A complete book or report in this form is more difficult and slower to print than a roll. If the negative has been preserved in roll form, duplicates or enlarged facsimiles can easily be made.

The unit card mount is one of the most interesting and significant developments in mechanized data handling. As developed by Filmsort, the system provides a standard punch card with a die cut opening into which a frame of microfilm is mounted. Data are punched on the card in the usual manner and the full gamut of machine searching techniques can be employed. The idea is simple but the mechanization employed is extensive. There are machines to cut and mount the microfilms, card to card printers, high speed printing machines to make en-

(*continued on page* 92)

RENT

ALL YOUR PRODUCTION EQUIPMENT

WITH OPTION TO BUY

FROM BEHREND'S

Chicago's Largest!

- Cameras
- Lighting Equipment
- Sound Equipment
- Editing Equipment
- Animation Equipment

BEHREND CINE CORP.

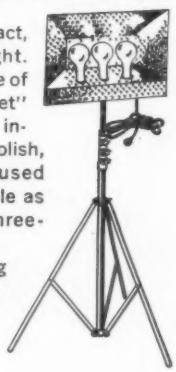
161 E. GRAND AVE.
CHICAGO 11, ILLINOIS
Phone: Michigan 2-2281
(Formerly Television Equipment Co.)

Get more information. Circle 405, page 81

WIDE LIGHTING COVERAGE

NO HOT SPOTS • NO FALL-OFF

Efficient, compact, and light-weight. Reflectors made of "condenser-facet" aluminum, with integral lifetime polish, for even, diffused lighting. Available as one-, two- or three-light reflectors in sets including stands and fibre carrying case.



Designed for the commercial and industrial photographer who demands *Quality* in his equipment. Write now for free illustrated literature and the nearest dealer in your area.

DEALERS: *Some distributorships still open.*

ERTLER PHOTO EQUIPMENT
DIVISION OF SUPERIOR STUDIOS

Dept. C, 1785 E. 45th St., Cleveland 3, Ohio
Get more information. Circle 431, page 81

pencil chewers;

Why be nervous and uneasy about color work?

Instead, go right to K & L with your requirements for Dye Transfers & Ektacolor ("C") prints for reproduction, comps, displays, color processing, flexichromes, transparencies, slides and filmstrips. Be sure of finest, exact color reproduction **delivered on time.** Discuss problems with K & L's top technicians — Sam Lang and Len Zoref.
Call or write for free Color Data Handbook and complete Price List.

KURSHAN AND LANG color service, inc.
Dept. PM-9
10 East 46th Street,
New York 17, N. Y.
MUrray Hill 7-2595

Get more information. Circle 457, page 81

PROFESSIONAL

16MM

BLACK reversal processing and printing WHITE

Fastax Specialists

Write for our circular

LAB TV

723 SEVENTH AVENUE at 48th ST., N. Y. 19
11th FLOOR JUdson 6-2293

Get more information. Circle 459, page 81

MICROREPRODUCTION

(*continued from page* 91)

largements, reading machines and other devices. Some of the equipment is designed for relatively low production while other pieces are exceedingly rapid. All of these devices supplement regular punched card equipment.

Interestingly enough negative film is preferred for many of these operations. In machine handling the film is inevitably scratched or abraded. As the blemishes fill with dirt they blend into the background of the negative; on a positive they would result in false lines.

The U.S. Air Force at Wright Patterson AFB, Dayton, Ohio, has embarked on a large-scale program using these methods. The Micromechanized Engineering Data for Automated Logistics program known as MEDAL is described in an interesting publication issued in January of this year. Industry is taking advantage of the possibilities inherent in the system. The vast Minicard program is a variation.

Obviously in the limited space of a column only a few highpoints in the use of microfilm can be mentioned. They serve not only to indicate the great possibilities of the technique but also to underscore the admonition given at the beginning—*the time to prepare to use microfilm is before it is made.*—THE END

CIBA

(*continued from page* 51)

the use of recorded sales presentations. An actual presentation is taped, unknown to the salesman but with the cooperation of the customer, and played at the training center. Both instructor and class offer comment and criticism. Here, as in virtually every aspect of the training cycle, the effort is made to be as practical and as realistic as possible.

All five members of the training staff are former salesmen, selected for training duty as part of a general training program to broaden their experience with all phases of CIBA operations. Sterling Weaver, sales training director, has been in the training department for 3½ years and has a degree in psychology.

When asked if any deficiencies were uncovered in the construction or design of the training center, Weaver suggested that an improvement would be a telephone from the projection booth to his office. In all other respects, he felt that the center was eminently suited to its task. What more could anyone ask?—THE END

"Splendid job, Hotchkiss, splendid!"

HOW TO GET CONGRATULATIONS on your VISUAL PRESENTATIONS!

Watch your personal stock shoot skywards when you entrust the complexities of your company's visual presentations to NATIONAL STUDIOS! We can tell and sell your product story more dynamically, more efficiently, more economically because we're geared for precisely this service: it's our bread-and-butter business, not a sideline!

Let NATIONAL

- **Prepare your Lecture Slides**
- **Prepare your Advertising Slides**
- **Prepare your Film Strips**
- **Prepare your Vugraphs**
- **Supply your Projectors**

Send for Free Brochure
For Quality Workmanship...
For Unequalled Service... Since 1912

NATIONAL STUDIOS
42 W. 48 St. • N. Y. 36 • JU 2-1926

Get more information. Circle 475, page 81

REVERSAL PROCESSING
SOUND RECORDING
8m — 16mm FILM IN STOCK
• INDUSTRIAL • TELEVISION • TRAINING
24 HOUR SERVICE
SOUTHEASTERN
FILM PROCESSING COMPANY
1305 Geiger Ave. Columbia 2, S.C.

Get more information. Circle 491, page 81

THE SPEEDOTRON COMPANY

ELECTRONIC FLASH EQUIPMENT
5156 W. Higgins Ave., Chicago 30, Ill.

Get more information. Circle 493, page 81

"CHILL-CHASER" DEVELOPING TANK HEATER

Automatically maintains any required temperature within 1°F. plus or minus. Works on any 115 V A.C. outlet. Light; rigid; of special photographic stainless steel; may be used as stirring rod. *Prices $19 to $39.* Immersion lengths, 5" to 40".

At leading dealers, or write us for folder.

Still-Man Equipment Corp., 433 E. 164th St., New York 56.

Get more information. Circle 495, page 81

SHORTCUT TO MORE PAY in INDUSTRIAL PHOTOGRAPHY

Unique, spare-time training gives vital professional Know-How plus self-confidence! Qualifies you for high pay assignments in months—not years! Train at home or Resident School. Our 50th year. Low-cost! Easy Payments. G.I. Approved. Illustrated FREE Booklet tells all. WRITE TODAY!

NEW YORK INSTITUTE OF PHOTOGRAPHY
Dept. 47, 10 West 33 Street, New York 1, N.Y.

Get more information. Circle 477, page 81

CLASSIFIED ADS.....

Rate for all classifications is 30¢ per word, minimum order $4.00; except Position Wanted which is 15¢ per word. Display ad rate: $27.00 per inch. Payment must accompany order. 10% discount for ads in three consecutive issues, if entire bill is paid in advance. Count each word, including each word in address. A PMI box number counts as 5 words. Only Agate type is used. First word set in caps at no extra charge. Additional words in caps—10¢ per word extra.

Copy must be received before the 10th of the month preceding desired issue (example: Oct. 10th for Nov. issue which is mailed early in Nov.) Please print or type copy.

SITUATION WANTED

Experienced commercial photographer capable in all phases of photography desires position with progressive firm. Have executive type aircraft with camera port and related equipment. Also have finest color negative analyzer available to do your color printing. Age 25, 2 children. Will relocate immediately. Box 802, Oklahoma City, Okla.

POSITIONS WANTED

Well qualified graduates of Brooks Institute, fully trained in all phases of professional photography (still and motion), are available if contacts are made well in advance of graduation. Your employment inquiry will receive prompt attention. One or more of our selected, advanced students will correspond with you regarding your position. The demand for Brooks graduates is always greater than the supply. The earlier your request is received, the sooner the placement can be made. Brooks Institute of Photography, 2190 Alston Road, Santa Barbara, California.

SERVICES

Agfacolor Reversal Film ASA 50 processing included 35 mm (20 exposure) $3.50, 36 exposure $5.40, 127, 620 and 120 $2.75. GENPHOTO, 136-140 Charles, Boston 14, Mass.

EKTACHROME, EKTACOLOR, ANSCOCHROME PROCESSED CAREFULLY & PROMPTLY. 4 x 5—50¢ per sheet. 135-20 exp. $1.35 mounted. Quality printing at reasonable prices. Try our service on your next color job. Kenmore Color Lab. P.O. Box 93, Kenmore, N.Y.

ALBUMS, frames, mounts! Large selection. Commercial or wedding albums gold imprinted with customer's copy! Free wholesale catalog. Crestwood, 3601 West 71st., Kansas City, Missouri.

QUALITY AIRBRUSH RETOUCHING. ALL PHASES. Robert M. Daly, 130 State St., New London, Conn.

CAMERAS, ACCESSORIES FOR SALE

Kodak C-3 Color Conversion Kit, Latest Model, with 5x7 Kodak Auto-Focus Model E. Enlarger, new condition used only three months, Price $1800.00 F.O.B. lists at $2850.00. Photo-Art Studio, Inc, 406 W. Washington St., Charleston 2, W. Va.

DEALERS SELL LENSES from our catalog. We carry stock. BURKE & JAMES, INC., 321 S. Wabash Ave., Chicago.

INSTRUMENTATION

(*continued from page 76*)

subject of Ralph Wright of J. W. Fecker. His definition of unconventional was the example of a system faster than f/1 and of greater focal length than 100 in. He discussed two classifications, fiber optics and long focal optics. Fiber optics, consisting of a bundle of glass fibers fused together, can be bent around irregular paths and can also be used as field flatteners (*see PMI Sept., 1958*). Long focal length optical systems up to about 2,000 in. are in the design stage, and an interesting design aim was mentioned which will resolve 0.1 second of arc with a 1 degree field and an image resolution of 40 lines/mm.

A look into the future

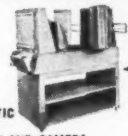
Implications of the Expanding Photographic Instrumentation Requirement by Dr. Duncan MacDonald, Itek, was a well considered look into the future. The speaker stressed the need for information and explained that the behavior of society as a whole depends on an exchange of information. Photo instrumentation, he felt, plays an important part in all information exchanges but needs basic changes to do its job better yet. What is needed is a new technology combining optics and electronics, which are really not in competition with each other, but are being combined to do the job. The two sciences can and will cross-fertilize each other and produce something which may be called "Eloptics" or "Optonics." Needed are new materials and mechanical engineering advances to take full advantage of progress being made. Also needed is greater appreciation of each other's problems on the part of the photo instrumentation engineer and electronics engineer. Also very much required is a common language, since the same terms often mean entirely different things to differently oriented engineers, i.e. spectrum.

Some predictions for the next decade were re-usable films, spectral response extension beyond 14,000 angstroms and greater sensitivity to infra-red. The speaker also explained that many neglected "processes" already exist in nature and he mentioned micro-organism which might be used as carrier material ("maybe we'll take pictures on bugs") as well as, facetiously, the assumption that lobster shells probably contain dyes sensitive to infra-red ("Why else do they turn red from heat."). The main emphasis was on stimulating thought along unconventional lines.—THE END

Lacey-Luci CAMERAS — ART AIDS

PRECISION ENGINEERED PROCESS CAMERAS

FOR EVERY PURPOSE



IMPERIAL HORIZONTAL CAMERA
- 17"x22" Film Holder
- 325% Enlargement or Reduction

MAJESTIC ANGLE ART AID AND CAMERA
- 18½"x24½" Viewing Area
- 24"x24" Copy Board
- Interchangeable lenses if desired

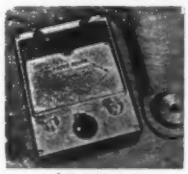
LACEY-LUCI Junior & Senior Process Cameras
- Rugged Steel Construction
- 400% Enlargement or Reduction
- Steel calibration tapes
- Automatic Timer
- Interchangeable lenses if desired

Send for Catalog H
LACEY-LUCI PROD., INC.
31 Central Ave. • Newark 2, N. J.
DEALERS: Choice Territories Open

Cameras from $339.00 up

Get more information. Circle 460, page 81

PHOTO-DESIGN
COLOR ENLARGING METER



- Photo-Electrically determines exposure for Type C, Type R, Printon and dye transfer enlarging.
- High accuracy—simplified operation—saves time and money.
- Can be used with any enlarger.

$135.00
Write for free Illustrated Folder.
LESTER C. HEHN—Engineering
30 Manorhaven Blvd., Port Washington, N. Y.

Get more information. Circle 442, page 81

SENSITOMETRY, by Lobel and Dubois $5.00
Two leading emulsion scientists start by explaining fundamentals and go on to discuss meaning of graphs, curves, and data sheets on film, plates and papers. Wherever industrial, or other applied photography is done, testing and measuring of photo materials make this a must book. At your book or camera store or from Amphoto, 33 W. 60th St., New York 23, N.Y.

Get more information. Circle 504, page 81

A SPARE PACKARD SHUTTER IS A NECESSITY
Order From Your Jobber
Manufactured Only By
Michigan Photo Shutter Co.
3605 So. Burdick St. Kalamazoo, Mich

Get more information. Circle 466, page 81

BACKGROUNDS
on spring loaded rollers for studio or outside use.
Fabric hand processed with flexible gelatin sizing & hand painted with oil colors.
72" W x 96" blk. one side gray or white reverse—complete w/brackets.
$23.00
CAMDEN ARTCRAFT CO.
180 N. Wacker Drive Chicago 6, Ill.

Get more information. Circle 417, page 81

Industrial Photo Dealers are specialists who can help you choose the right equipment for the job
See PMI's Directory of Industrial Dealers on page 61

NEW!
Lisco REGAL
4x5 CUT FILM HOLDER

Different from any other holder!

Made of Rugged, Durable **RHINO-LITE** Will not crack, split, or break!

SOLID METAL INTERIOR Prevents warping... assures utmost strength and rigidity!

THINNER New design gives you more holders in less space... permits faster, easier loading!

SHARPEST FOCUS Famous Lisco focal plane accuracy...plus the latest advances in cut film holder design and construction—at no increase in price!..... **$4.50** list

Available in 4 x 5 size only

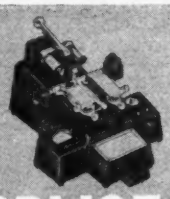
2-Year Unconditional Guarantee!

For your requirements of other sizes, be sure to ask for Lisco holders in traditional cherrywood and aluminum... 5x7, 8x10, 4x5, 2¼x3¼ and 3¼x4¼.

See your local camera dealer or write for free literature.

LISCO PRODUCTS CO.
1614 Victory Blvd • Glendale 1, Calif

Get more information. Circle 463, page 81



SPLICE 35MM COLOR IN 10 SECONDS

Handle customer 35 mm Color Film in 10 seconds or less — free from film damage — with the miracle Presto Splicer. Completely automatic 2 second splicing action and self alignment assures perfect splices every time — even in the dark room.

The amazing Presto Splicer eliminates adhesives, emulsion scraping, and all the mess normally associated with out-dated splicer methods. Presto Splicer permanently butt-welds the film back to its original condition — end to end. Double thickness is done away with as well as out of focus frames. Film is automatically re-plasticized when fused. Write for illustrated Brochure.

PRESTOSEAL MANUFACTURING CORP.
37-27 33rd STREET
LONG ISLAND CITY 1, NEW YORK

Export Dept.: Reeves Equipment Corp.
10 E. 52nd St., N.Y.C.–Cable: Reevesquip, New York

SEE US AT BOOTH 38, SMPTE

Get more information. Circle 485, page 81

ADVERTISERS' INDEX

SEPTEMBER 1959

ACCURA INDUSTRIES 89
ALLIED IMPEX CORP. 26
AMPHOTO 93
ANSCO DIVISION (General Aniline & Film Corp. 62
ARRIFLEX CORP. OF AMERICA (Kling) 33
AUDIO MASTER 72

BAR-RAY PRODUCTS, INC. 25
BEHREND CINE CORPORATION 91
BENSON-LEHNER CORPORATION 83
BERNDT-BACH, INC. 69
BESELER CO., CHARLES, THE 29
BLAKESLEE — LANE, INC. 72
BOHM & CO., H. A. (Voightlander) 14
BOOSEY & HAWKS, INC. 76
BROOKS INSTITUTE OF PHOTOGRAPHY 90
BURKE & JAMES, INC. 72
BYRON, INCORPORATED 32

CALUMET MFG. CO. ..... 22, SECOND COVER
CAMDEN ARTCRAFT CO. 93
CAMERA EQUIPMENT CO. 15, 16
CAPITAL FILM LABORATORIES 73
CINE SPEED, INC. 88
COLBURN LABORATORY, INC., GEO. W. 60
COLIND PHOTOGRAPHY 73
COLUMBIAN ENAMELING & STAMPING CO., INC. 73
CORELLI — JACOBS 74
CORMAC CHEMICAL CORP. 3

DE GROFF LABORATORIES 86
DIRECTORY OF INDUSTAL DEALERS 61
DISTRIBUTOR'S GROUP, THE 90
DU PONT DE NEMOURE & CO., INC., E. I. 23
DURST (U.S.A.), INC. 18

EASTMAN KODAK CO. ..... 4-5, FOURTH COVER
EDMUND SCIENTIFIC COMPANY 17
EDWAL SCIENTIFIC PRODUCTS CORP. 31
ERTLER PHOTO EQUIPMENT 91

FILMLINE CORP. 84
FISHER COMPANY, OSCAR 20
FLORMAN & BABB, INC. 8
FOTOMATIC CORPORATION 90

GENERAL ELECTRIC CO., INC. 27
GOLDBERG BROS. 90
GORDON ENTERPRISES 70
GRAFLEX, INC. 13

HALOID XEROX INC. 7
HARWALD COMPANY 31
HASTING HOUSE 91
HEHN ENGINEERING, LESTER C. 93
HERSHEY MFG. CO 30
HEITZ, INC. KARL 19
HINELIGHT CORPORATION 75
HOLLYWOOD CAMERA CO. 76
HOUSTON FEARLESS CORP. 59
HULCHER CO., CHARLES 68
HUNT CO., PHILIP A. 21

ILFORD, INC. 11
INDUSTRIAL EXHIBITIONS, INC. 86
INTERSCIENCE PUBLISHERS, INC. 89
INTERSTATE PHOTO SUPPLY CORP. 26

JERI COMPANY, INC., ANDREW 90
JF FILM SERVICE 75
JOHNKE MFG. COMPANY 90

KIER PHOTO SERVICE 76
KIN-O-LUX, INC. 88
KURSHAN & LANG 92

LABCRAFT INTERNATIONAL CORP. 90
LAB TV 92
LACEY-LUCI PRODUCTS COMPANY 93
LEKTRA LABORATORIES 24
LENZ WASHER COMPANY 89
LISCO PRODUCTS CO. 94

MACBETH INSTRUMENT CO. 74
MAYER COLOR LABS, KURT 88
MICHIGAN PHOTO SHUTTER CO. 93
MICRO RECORD CORP. 89
MILLIKEN CO., D. B. 75
MITCHELL CAMERA CORP. ..... THIRD COVER
MOLE-RICHARDSON CO. 91
MORGAN & MORGAN PUBLISHERS 88
MOVIOLA MFG. CO. 60

NATIONAL CAMERA REPAIR 86
NATIONAL STUDIOS 92
NEGA-FILE CO. 86
N. Y. INSTITUTE OF PHOTOGRAPHY 92
NIKON, INC. 9

PAILLARD, INC. 31, 34
PELLEGRINI — PIEK 89
PLYMOUTH PRODUCTS CO., INC. 12
POLAROID CORP. 85
POST CO., FREDERICK 10
PRESTOSEAL 94

RAPID FILM TECHNIQUE 90
READERS SERVICE 81, 82
ROLOR INDUSTRIAL CORP. 26

SALTZMAN, INC., J. G. 79
SCHEIBE ENGINEERING, INC. 76
SIMMONS BROS. 80
SOCIETY OF PHOTOGRAPHIC SCIENTISTS & ENGINEERS 28
SOCIETY OF MOTION PICTURE & TELEVISION ENGINEERS 87
S.O.S. CINEMA SUPPLY CORP. 78
SOUTHEASTERN FILM PROCESSING CO. 92
SPEEDOTRON COMPANY, THE 92
SPINDLER & SAUPPE 77
STILL-MAN EQUIPMENT CORP. 92

TERMINI FILM EDITORIAL SERVICE, INC. 74
TRIANGLE PROJECTORS, INC. 89

VALENTINO, T. J. 78
VIDEO FILM LABORATORIES 78

WATSON, INC., E. E. 89
WESTERN CINE SERVICE, INC. 88
WHITMORE PRODUCTS 89

PMI Advertising Sales Representatives
Milton T. Astroff, Adv. Mgr.
General Offices: 33 W. 60th St., New York 23, NY

East: Jules Wartell, Eastern Adv. Mgr. 33 W. 60th St. New York 23, N. Y. PLaza 7-3700

Midwest: S. William Pattis & Assoc. Sales Rep. 6316 N. Lincoln Ave. Chicago 45, Illinois IRving 8-4242

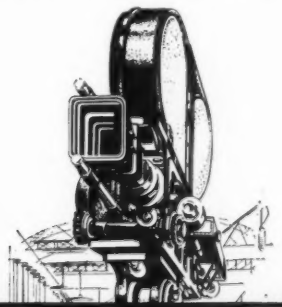
West: Bert Dellins, Western Adv. Mgr. 13758 Victory Blvd. Van Nuys, Calif. TRiangle 3-4153

A Salute to Mitchell Camera users throughout the world on the

40th ANNIVERSARY

of

MITCHELL CAMERA CORPORATION



LIMITATION OF SPACE PERMITS ONLY A PARTIAL LISTING OF USERS

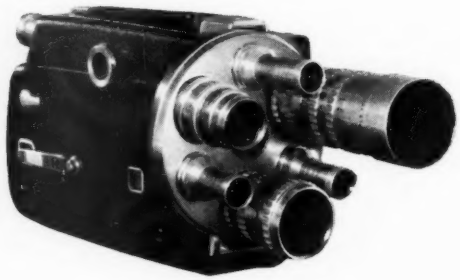
Mitchell Camera Corporation • 666 West Harvard Street • Glendale 4, California

Get more information. Circle 470, page 81

TO SHOOT A SHOW THAT SPARKLES

KODAK RETINA REFLEX S, with 50mm *f*/2.8 lens

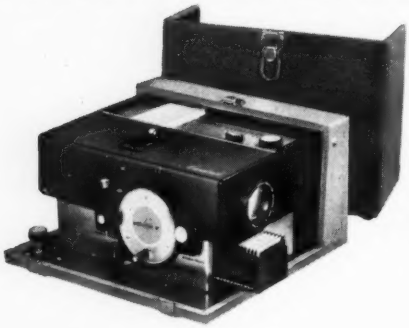
Contains refinements and precision so imperative for the professional. Permits *close-up-critical* viewing and focusing on full-area ground glass, plus pinpoint focusing through split-image rangefinder. Six interchangeable lenses in barrel available—28mm to 135mm. Direct meter-linked control of aperture with all lenses. Shutter speed and *f*/ scales are cross linked. Automatic diaphragm *wide open* for viewing, stops down as you shoot. Shutter speeds to 1/500. Price, $199.50 with *f*/2.8 lens.



CINE-KODAK K-100 TURRET CAMERA, 16mm

The craftsman's action camera. Meets any demand of industry. Each lens—wide-angle to telephoto—has its own viewfinder, so when you switch lenses you always view exactly what you're shooting. Film capacity: 100-ft. roll. Exposes 40 feet at one winding. Variable speeds, 16 to 64 frames/sec., and single-frame shooting. Includes provision for special effects. Priced from $337.

AND TO SHOW IT AT ITS BEST

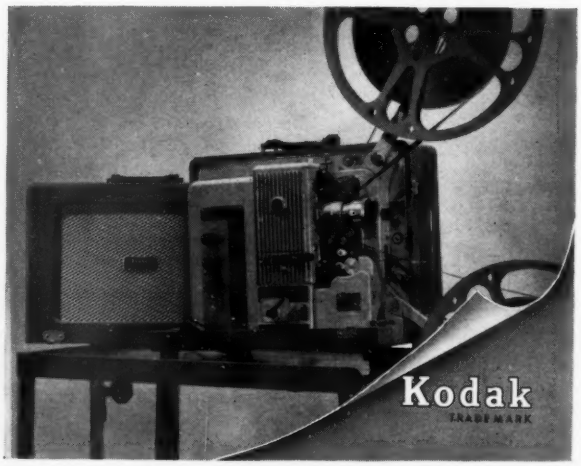


KODAK CAVALCADE SLIDE PROJECTOR, Model 500

Runs a professionally smooth, needle-sharp slide show by itself (contains built-in timer for 4-, 8-, 16-second preset interval). Or lets *you* run the show (by remote control or by push-button control on the projector). Split-second interval between slides eliminates long dark-screen periods. All slides are pre-warmed to minimize focus shifts. Other features: rapid re-run or advance; built-in screen pointer; easy editing (edit while slides are in projector); two-element lamp so you can flip a switch to select 300-watt or 500-watt brilliance. Price, $149.50.

KODAK PAGEANT 16mm SOUND PROJECTOR

A professional-type projector featuring Kodak's exclusive Super-40 shutter, which throws 40% more light on screen at sound speed than ordinary shutters. Reel arms, belts, cords, are all attached. Simplified film-threading path is printed right on the projector. Powerful, full-fidelity sound system—finger-tip control up to 25 watts. No oiling—permanently lubricated! Models for optical only or magnetic and optical playback, or for *recording* and playing back your own magnetic sound. Priced from $429.



Write for literature, prices, and further information on any of these Kodak cameras and projectors. Prices are list, include Federal Tax where applicable, and are subject to change without notice.

EASTMAN KODAK COMPANY
Rochester 4, N. Y.